

May 6, 1957

50 cents

# AVIATION WEEK

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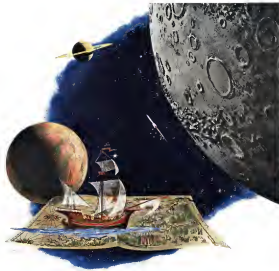


Supersonic Escape  
Barrier Breached

Orenda Iroquois B-47 Test Bed



Martin P6M SeaMaster Crash Report



Widening mankind's horizon by conquering

## WIDE OPEN SPACES

Men of vision, making the unknown known, have widened man's horizon—advanced civilization. From the great seafaring century exploration of the earth, its resources, lands and peoples, came knowledge now in everyday use. Today at CONVAIR Aerospace, scientists and engineers have already embarked on the greatest challenge of the twentieth century—man's conquest of the uncharted, unknown and infinite universe. Knowledge gained from solving the mysteries of space will bring mankind untold benefits.

**CONVAIR**

A DIVISION OF GENERAL DYNAMICS CORPORATION



CONVAIR Aerospace is building a new facility at San Diego, California, which will be devoted to research, development, testing, production and an inventory of the U.S. Air Force's Advanced Tactical Fighter. It will also be used as well as other projects looking into the future of aerospace.



## New star beneath the southern cross



Soon South America will look up to the new Fairchild F-27 transport already ordered by South American airlines.

This exciting new propeller-driven transport is becoming as popular in the Southern Hemisphere as it is in the North American continent. Its special qualities make it ideal for regional airlines, and a valuable addition to corporate aircraft fleets as well.

The F-27 is fast—cruises at 380 mph on the power of airframe-proven propeller engines. The cabin is pressurized to permit flight over Andes peaks and Patagonia plains with equal ease. Small field performance puts most back-country strips within easy F-27 reach.

Easy in versatility, high on performance, the F-27 is low in cost—its inexpensive to fly, to maintain, to buy.

Addres inquiries to: R. James Pfeiffer, Executive Director of Customer Relations, Fairchild Engine & Airplane Corporation, Hagerstown 15, Maryland.



THE FINEST AIRCRAFT FOR AIRLINES,  
CORPORATIONS AND MILITARY SERVICES

- May 4-5-1955 Annual Meeting, Aero Club of America, Sheraton Hotel, Denver
- May 10-14 Federal Engineering Society of Aeronautics and Mechanics, American Institute of Electrical Engineers, Baltimore Hotel, Baltimore, Ohio
- May 14-16 Society of Automotive Engineers, Technical Committee for Aeronautics, Ambassador Hotel, Los Angeles, Calif.
- May 19-20 Annual Technical Convention, Committee on Air Transportation, American Institute of Electrical Engineers, Ballway Hotel, Denver, Ohio
- May 21-22-1955 Annual National Forum, American Helicopter Society, Sheraton Park Hotel, Washington, D. C.
- May 23-25-1955-1956, Aircraft and Related Design and Their Applications, Western Union Conference, N. Y. C.
- May 23-24-What the Reader and Music Program Means to the Chemical Industry, Young Meeting, Commercial Club of Development Inc., French Lick, Ind.
- May 23-24-National Conference on Aero-nautical Electronics Sponsored by the Institute of Radio Engineers, Denver, Colo.
- May 24-Engineers, Operators & Manufacturers Forum sponsored by Post & Winney Aircraft Division and distribution, Pacific Northwest, Corp., Georgetown Hotel, Denver, Colo. Dikary system, May 27 at Ambassador Hotel, Berkeley, Calif.
- May 28 at Hotel Cleveland, Oakland, Calif. and May 29 at New Washington Hotel, Seattle, Wash.
- May 28-29-4th Air Transport Conference, Air Transport Division, American Society of Civil Engineers, Park Sheraton Hotel, New York.
- May 28-29-1955-1956 Edition Conference, Air Transport, New York Conference, Ball, Washington, D. C.
- May 28-29-1955 Design Engineering Conference, American Society of Mechanical Engineers, Colorado, New York.
- May 30-Annual Meeting and award of Distinguished Achievement Medal, University Club, 1 W. 54 St., New York.

(Continued on page 5)



YERN-WALL, machinist, cutting for the engine inside the propeller for Dew.

## QUALITY MAGNESIUM CASTINGS

for aircraft and missiles

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YOU NAME THE CASTING. Dow can supply you with industry and extraordinary shapes or sizes. Specialized techniques rapidly machine your standards and specifications. Heavy-wall or thin-wall, room or elevated temperature use, the best-wood service-answers to your problems at Dow magnesium casting. Contact your nearest Dow sales office for additional information. That most chemical company, Plumbly Sales, Bay City, Michigan.

YOU CAN DEPEND ON

**DOW**

## FROM BRIDE TO BIRDWOMAN



Alys McKay Bryant, one of America's first women pilots, was one of the women who broke the barrier of aviation, and an aerial pioneer of note.

(Photo Courtesy: National Air Museum, Smithsonian Institution)

Alys McKay met John Milton Bryant the day she helped pull him from a crashed airplane. In the days

that followed, while she called on the young pilot during his recovery, she became more and more interested in flying.

So, in December, 1912, Alys learned to fly. She then married John Bryant and joined him as an aerial flying act, billed as "The Bonnet Flyers." The Bryants became one of the most prominent flying teams in the Pacific Northwest, appearing at

fairs, carnivals and specially arranged meets.

Mrs. Bryant flew under her maiden name and established a number of records, including the women's altitude record, and was one of the first women to fly in Canada. Alys Bryant was a notable flyer of the era, as was her brother Frank, a third member of the team.

After her barnstorming days were over, Mrs. Bryant became connected with the Bonnet Company, manufacturer of flying boats. During World War I she worked with the Goodyear Company in the development and construction of airships.



A pioneer in research and development of aviation fuels, Phillips Petroleum Company is today a permanent supplier of high octane gasoline for commercial, private and military aircraft.

In step with the future, Phillips is a leading producer of super-performance Jet Fuels for the latest designs in helicopters and jets. And Phillips research continues to lead the way for development of fuels for the aircraft of tomorrow.

AVIATION DIVISION • PHILLIPS PETROLEUM COMPANY • BARTLESVILLE, OKLAHOMA

(Continued from page 4)

- May 20-26th Annual Section Five Safety Seminar, National Fire Protection Assn., Hotel Statler, Los Angeles, Calif.
- May 24 June 2-2nd Ann. Int. Show, Inc. of French Aircraft Constructors, Le Bourget, France, Paris.
- May 25-26—Annual Bureau Aircraft Safety Seminar, sponsored by Flight Safety, Trans-Atlantic, Park Sheraton Hotel, New York.
- May 30 June 2-3rd Night National Civil Aviation sponsored by Society of Aircraft Engineers, Civil Aviation Support Division, 1-10, United Nations, and Operations Meeting for Research and Experiments, Aircraft Owners, sponsored by Reading, Aviation Service, Reading, Massachusetts.
- June 1-4-1st General Aviation Las Vegas Seminar, Western Union, Las Vegas.
- June 4-5-Symposium on Materials for Aerospace Components, University of Pennsylvania, Philadelphia, Pa.
- June 4-7-National Symposium on Electronic Production Techniques, Willard Hotel, Washington, D. C.
- June 5-6-2nd National Personnel Accounting Symposium in conjunction with National Personnel Office Conference, Sheraton Hotel, Chicago, Ill.
- June 9-14-5th Annual Meeting, American Society of Mechanical Engineers, Sheraton Hotel, New Orleans, La.
- June 10-14-1st Semi on Vehicle Mechanics, sponsored by New York University, College of Engineering, Admittance to Dr. R. L. Brinkley, N. Y. University College of Engineering, University Heights, C. N. Y.
- June 11-13-1st Modern Plant Management & Engineering Conference, Civic Auditorium, San Francisco, Calif.
- June 14-15-1st Air Transport, New England, Boston, Mass. at Boston Progress, Lowell Technology Institute, Lowell, Mass.
- June 17-18-National Conference on Military Electronics, Statler Park, Hotel Washington, D. C., sponsored by Institute of Radio Engineers.
- June 17-18-1st Ann. Women's International Air Race, McAllen, Tex. Open for pilots, water, New Braunfels, Entry Class 7-10, 11-14, 15-18, 19-24.
- June 17-18-National Symposium, Building Institute of the Aeronautical Sciences, Bell Hotel, Los Angeles, Calif.
- June 23-25-26th Annual Meeting, Aeronautical Association & Manufacturers Assn., The Broadhurst, Colorado Springs, Colo.
- June 24-25-1st National Aviation Day, Miami.
- July 1-12-1st English Lockheed International Aeronautical Competition, the National Air Sports Board (read) and the Royal Aero Club, Coventry Civil Aerodrome, Birmingham, England.
- Aug. 20-21-2nd Western Electronic Show & Convention, Cow Palace, San Francisco, Calif.
- Sept. 14-16th International Aeronautical Conference, Royal Aeronautical Society and Institute of the Aeronautical Sciences, Farnborough and London, England.
- Sept. 24-25-1st Flight Display Society of British Aircraft Constructors, Farnborough, England.



NEW

*Trans-Sonics*

## "TAPE-ON" SURFACE TEMPERATURE RESISTORS for Temperature Telemetry

- NO THICKER THAN A PIECE OF TAPE
- OUTPUT UP TO 3 VOLTS WITHOUT AMPLIFICATION
- AVAILABLE IN VARIOUS RANGES FROM  $-300^{\circ}$  to  $+1400^{\circ}$ F
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- NO NEED TO SOLDER—QUICK AND EASY "TAPE-ON" INSTALLATION

Trans-Sonics Type 1371 "Tape-on" Surface Temperature Resistors are precision resistance thermometers with a platinum resistance winding in the sensing element. These resistors which are no thicker than a piece of tape may be applied to any surface whose temperatures are to be measured. In a continuous circuit, they modulate standard telemetering transmitters without amplification. The new Type 1371 "Tape-on" Surface Temperature Resistors may be added to an installation using other Trans-Sonics temperature transmitters without any further circuit modifications. Each resistor is furnished with 50' long shrink-covered conductive leads. Write for Bulletin 1371 to Trans-Sonics, Inc., Dept. 7

New York, N.Y.

## SPECIFICATIONS

- Size:  $1/2" \times 1/4"$   
Accuracy:  $\pm 1\%$  at full scale range  
Precision:  $\pm 0.05\%$  at full scale range  
Maximum Continuous Current: 20 ma rms (averaged over 1 second)  
Electromagnetic Interference Immunity:  $10^4$  volts/feet  
Size: 10 cps  $\pm 10$ ; 20 cps  $\pm 20$ ; 30 cps  $\pm 30$   
Model: 100 ohm in any direction, per paragraph 4.1.1.1 of MIL-STD-883C (10 milliseconds dwell)

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## Equipped to handle $-80^{\circ}$ F. to $400^{\circ}$ F. with AUTO-LITE 350 WIRE

Wide scale, high speed jet travel will be a reality with the new Lockheed propjet Electra. The Electra will be powered by thrifty and quiet Allison engines. These engines reduce frontal area and engine weight by one-half over piston engines of equal horsepower. The Electra is capable of reaching an altitude of 30,000 feet faster than any propeller-driven aircraft in service, and is specified to use Auto-Lite 350 Wire

in many critical applications. Like many other aircraft manufacturers, Lockheed finds the extra temperature range performance of Auto-Lite 350 Wire ideally suited to jet aircraft demands. In addition to its high resistance to abrasion, flame, solvents, fuels, and lubricants, many manufacturers find that Auto-Lite 350 Wire reduces production costs compared with other high-temperature wires.

- Flexible at temperatures below  $-80^{\circ}$ F.
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- Free shipping
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- In several applications, this wire is cable delivery at  $-80^{\circ}$ F. or at an altitude of 40,000 ft. as measured at the connector
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- Meets Spec. MIL-W-8177, U.S.A.F.



For complete information on Auto-Lite Aircraft Wire, including specifications and samples, write to: The Electric Auto-Lite Company, New and Cedar Streets, Port Huron, Michigan • Hialeah, Pennsylvania

# AUTO-LITE 350

GENERAL PURPOSE  
HIGH-TEMPERATURE  
AIRCRAFT WIRE







design  
with  
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## microcast quality control starts with the blueprint...

Quality Control at Austenal begins in the planning stage... long before any actual manufacture of parts is undertaken.

In order to achieve the finest finished product, design engineers consult first with Austenal engineers and profit from their experience and advice. Then, you can design directly for Microcast and take advantage of the special features it makes possible.

During manufacture, many separate and vital Quality Control steps check production—from the initial alloy melt to critical examination for dimensional accuracy and internal structural soundness.

Quality Control works hand in hand with advanced research to improve and maintain Microcast techniques and applications. For this purpose, Austenal maintains the industry's finest, most advanced research facilities.

Think Austenal when you design. You'll be sure that high quality and maximum performance will be built right from the beginning into any product you require.



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When-lower weight segments, impractical and prohibitively expensive to manufacture by any other means, are produced by Austenal to exacting aircraft standards.

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FLY WEATHER-WISE



These weather films prepared in consultation with the United States Weather Bureau

## WEATHER AND RADIO

HOW WEATHER CONDITIONS AFFECT THE  
PROPAGATION OF RADIO WAVES

**RADIO SKEWING** may vary from poor to exceptional, depending on the temperature stratification. Temperature variations alter refraction characteristics of the atmosphere. This can result in back scattering over great distances on VHF channels.

**Precipitation static**—ice crystals, snow flakes and rain droplets striking aircraft can cause crackling in headphones.

**Static due to lightning discharges.** These occasional bursts and crashes can be picked up at considerable distance. It is often your first indication of thunder storm activity.

**How to minimize static.** Change altitude if it can be done safely. Descend or climb as far as possible. When possible, avoid dry snow and areas devoid of ice crystals. Keep radio volume turned low to reduce background noise. It is preferable to use a higher frequency broadcast station for ADF bearing instead of low frequency range station. During periods of static, push headphones over temples when not listening—to keep fingers to maximum.



**Aerobically, increased radio equipment static.** These static increased phenomena cause communication between them to be lost. To the Signal Director of National Bureau of Standards (5 to 10,000 kilocycles for frequency of periods of poor reception).

### NEW MOBILGRADE AERO 10-TEMP

For improved performance, added protection and reduced maintenance of your lubricated parts—including instruments, where possible, from corrosion and maximum freedom of movement are provided by Mobilgrade Aero 10-TEMP.

For Top Flight Performance—Make it



Leader in  
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**write for sample installed on YOUR wire!**

Inspect a SEALINK sample installed on your wire...only then will you grasp the significance of this newest of Burndy developments for wiring! Here is the very first fully water-sealed splice exceeding all immersion, dielectric, voltage drop and tensile strength requirements...a splice that keeps out the elements. Rapid, controlled SEALINK installations are made with the Burndy MRS Hand Hytool without need for reversing the tool. SEALINKS are made for AWO conductor sizes 22 thru 10. Send us a sample of your wire—we'll send you an installed SEALINK plus full details on this new method for making insulated, sealed splices.

# BURNDY

NORWALK, CONNECTICUT



## "General's Jeep"

The Beaver is 1.20 half-tonned ideal for the movement of high ranking Officers into forward battle areas.

With 6 passengers, or a half ton of payload, and full tanks of fuel, the Beaver is airborne in less than 600 feet. (Clears 50 foot obstacle in 1000 feet).

THE *Beaver*

Designed and built by

**THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED**  
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Western Sales and Service: Municipal Airport, Edmonton, Alta.

Pacific Coast Sales and Service: Vancouver, B.C.





**VICKERS** helps scan new horizons...

by turning 3 tons with 13 pounds

The great "V-motor", exclusive step-down Lockhead Super Con-Quill, continues on surface water antenna. It requires a high power to weight ratio during operation. The mechanism must be compact, dependable, able to provide constant speed, regardless of load change... and operate in a position remote from the aircraft power supply.

The small (approximately 35 pounds) VICKERS PUMPS DRIVE more than meets the strict requirements of this type. (28 inch diameter) customer. And — like similar Vickers hydraulic components used in the Constellation for other purposes — provides proven dependability spanning many years of successful application.

- Other components include:
- Valve controlling flow control valve operates selected constant speed, regardless of load change.
  - 30 cc valve has selection of motor constant duration and speed.
  - Fluid displacement hydraulic motor for driving the indicator.

## VICKERS INCORPORATED

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

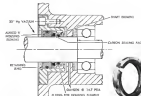


Fig. 1—Magnetic shaft seal isolates press oxygen at atmospheric pressure from 20" Hg vacuum. Eliminates explosion hazard — no lubricant is required.



Fig. 2—20" PRESSURE MAGNETIC SEAL



Fig. 4—10" PRESSURE MAGNETIC SEAL

## Effective Sealing of Oxygen Against Vacuum Accomplished by Magnetics

Gas leakage eliminated, despite extreme pressure differential — 20" Hg to 14.7 psi.

by E. A. Stevens

Isolating gas at atmospheric pressure from a high vacuum is a problem which only a shaft seal is able to solve. It is the only seal with the highest degree of reliability over long operating periods.

Similar, though usually less critical problems arise in handling gases of all kinds. The small, penetrative molecular dimensions of all gases make most types of seals ineffective after very short operating periods.

By applying magnetics to this problem, designers have come up with an effective solution (Fig. 1). Magnetic attraction between shaft element and housing element, evenly distributed around the circumference, completely seals working faces, insures effective sealing, and prolonged life as the seal "wears in."

### Operating Principle (Fig. 3)

A magnetized ring of Alnico V, with an O-ring gasket on its outer surface,



Fig. 3—Operating principle

is inserted in the housing. Another ring is mounted on the shaft and held firmly against the Alnico element by magnetic force. A carbon ring on the face of the shaft element restricts the degree of rotation of the magnet and allows a permanent, self-sealing face.

An O-ring mounted inside the shaft element prevents the confined fluid or gas from escaping along the shaft. The O-ring as the magnet element keeps the fluid from leaking out the bearing.

### Standard Magnetic Seals Available

Standard magnetic shaft seals are available up until liquids or gases at high or low pressure differentials across the seal. Shaft diameters up to 24" can be accommodated by low pressure model 20 (Fig. 2) and high pressure model 10 (Fig. 4). There is also a standard model, model 30, for shafts over 24".

### Advantages of Magnetic Shaft Seals

Reliable, effective sealing is characteristic of the magnetic shaft seal. One of the elements of the seal is permanent magnet, so the sealing force is "built-in." No springs or clamps are required. The sealing force is evenly distributed over the face of the seal. There's no gas leakage initially, and the seal "wears in" over its entire life.

It's many times longer than the life of the shaft.

It's more dependable in design and lighter in weight than any conventional seal.

The carbon sealing face is self-lubricating — runs cool and wears slowly.

### Typical Application of Magnetic Shaft Seal (Fig. 1)

Lewis Bros., Inc., of Newark, N.J., manufacturers of air pumps, were requested to build a pump with gas oxygen at atmospheric pressure on one side and 20" Hg vacuum on the other side. The shaft sealing problem called for dry contact between shaft, seal and housing owing to the possibility of explosion that use of a lubricant would present.

No conventional seal would be found that would function in this critical application without leakage.

However, a magnetic seal was designed that proved to be the ideal solution. It featured a carbon seal and ferrous ring operating inside. There was no need for lubrication since the carbon ring is self-lubricating. The improved design also embodied an O-ring so that the seal could be applied to pumps that were already in use in the field.

### Magnetic Shaft Seal Specifications

	Model	Seals
Shaft Inlet Pressure (max.)	20" Hg. Vac.	200
Shaft Dia. (in.)	24"	24"
Material	Steel and Alnico	

### Additional Technical Information is Available.

Send for complete brochure on self-sealing shaft seal.

**magnetic seal corp.**



505 W. 30th St.  
WASHINGTON, D.C.





## In the Front Office

Arthur W. Knott, head chairman, United City Products Corp., Cleveland; Mrs. Samuel A. Green, secretary; Mr. Kim Bell as president. Also J. Knott Knott, Jr. as director.

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Edward M. Bagshaw and Walter L. Lakin, vice presidents; American Electric Airco Corp., Hempstead, N. Y.

Also: C. E. Felt, a vice president; E. D. Gilman, secretary; Mr. Felt as vice president and division manager; Airco Division.

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John A. Dunbar and M. E. Gilman, vice presidents; Douglas Aircraft Co., Inc., Santa Monica, Calif.

John Knott, vice president; Adco Industries, Inc., Worcester, N. Y.

Blaine Forester, vice president-engineering; Spradley, Inc., Detroit, N. Y.

A. G. Jones, vice president general counsel and secretary; and E. A. Stevens, vice president treasurer; B. F. Goodrich Co., Akron, Ohio.

William H. French, Jr., Assistant Secretary at Defense (Manpower, Personnel and Research) Department of Defense, Washington, D. C.

## Honors and Elections

Leslie Freund, president of Bell Aircraft Corp.; and William G. Ladd, president of Chrysler Corp., have been elected directors of the National Industrial Conference Board, New York, N. Y.

Don B. Day, Deputy Chief of Staff; and Arthur E. Berman, of Intelligence, USAF, has been named a recipient of The National Civil Service League's Third, Second and Civil Service Awards.

Each Award winner trophy is "dedication, talent and ability to be found in the Federal civil service."

Kear Aho, J. S. Russell, USN, Chief of the Navy's Bureau of Aeronautics, has been named Honorary Chairman of the National Naval Aviation Council (the Thompson-Gibbs). The council (Aug. 1961) are being sponsored by the Institute of the Aeronautical Sciences and the US Navy.



2 cm Compressor Package



4 cm Compressor



6 and 8 cm Compressors



4 cm Portable Ground Service Cart

## PNEUMATIC POWER-PLUS

A leader in the development of dependable, lightweight pneumatic devices, Walter Kidde & Company, Inc., has in production rugged, tested 2, 4, 6 and 8 cm air compressors. Delivering air at 3,000 and 5,000 psi, Kidde compressors may be driven by air turbine, hydraulic or electric motor, gear box or direct engine unit. Equally available are compact package assemblies providing all essential components for optimum operation of pneumatic systems. Users of Kidde air compressors include Boeing, Fairchild, Lockheed,

North American, Republic, Douglas, Convair, Aero.

Also in production is the compact, portable 4 cm ground service cart (above, lower right) which supplies dry air (stated in shatterproof, windowed steel sphere) from 50 to 3,000 psi. Kidde has ground service carts and compressors with higher outlet pressures, larger capacities and various type drives which can be made to meet your exact specifications. For full information, write to Kidde today.

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**Kidde**

## INDUSTRY OBSERVER

►A third North American G-26 swept-powered test article, intermediate (slide between the subsonic-powered G-10 and the Mach 2.0 intermediate) model, has started in a test attempt from Air Force Missile Test Center, Patrick. All 314 Valses was lost in attempted takeoff when a rocket booster blew up. Presumably, another G-26 went out of control when the all-glass malfunctioned. Still earlier, the rocket engine failed to separate from the attack and the carrier carried aloft to light. G-26 booster is not the same as the three-barreled 485,000 lb thrust booster that will be used on the production version of the Nautilus.

►Allison Division of General Motors is working on two new engines—the 19V, a very large dual-spool turbojet with about twice the thrust of the 10,000 lb. Allison J71, and a two-speed turbojet with substantially greater output than the 3,750 shp Allison T38.

►Army-McDonnell Douglas competition for a high-altitude observation plane has been narrowed to two manufacturers—North American Aviation-Columbia and Grumman. Right competition was originally in the field. North American's entry is a twin boom, high wing, two-place aircraft powered by two General Electric T38 engines.

►Takeoff of Convair F-106A, now being flight tested at Edwards AFB, Calif., is made without afterburner because of the power of Pratt & Whitney's F75—approximately 15,000 lb. Afterburner takes development speed so rapidly that trouble is encountered in retreating the landing gear in time to keep the wheel well doors from being ripped off.

►Photocathode-type infrared detector, capable of operating at wavelengths out to an amount compared to previous one and one-half inches band and which requires no cooling provisions, has been developed by Texas Instruments Inc. Device exceeds performance characteristics which Raytheon and Perkin have relied on similar devices (some constant of two megawatts, some equivalent power of 0.0007 microwatts).

►Dick motion picture projector has been tested by Corvair Aeronautical Laboratory as part of an all-weather carrier landing system developed under the Navy's Project Puma. Dick motion is produced a few seconds ahead with a probability of 75%.

►Nas's all-weather carrier landing system has created a requirement for a new oil computer. Its task is to recompute a new oil content back into the navigation and traffic pattern.

►Engine placement on North American A-106's A1J jet-powered attack bomber is in the tail, with side-by-side jet exhaust protruding from the fuselage tail.

►Headline is looking for a forecast for its 100th anniversary in 1961. But let of present opinion to be 100th year in which our manufacturer believes he can make it a fraction of the rest of his made of other materials. Besides already his rejected proposals for a magazine for 100.

►Suzanne has pilot-flying F22 Flying Albatross vertical takeoff jet fighter. Pilot is installed in flying cockpit above the jet engine air intake. Previous to pilot flight, test article would operate controlled flights. The jet will later be equipped with an amateur wing (AW Dec. 24, p. 25).

►Lightweight constant-speed drive is under development by Hamilton Standard. New drive operates on a mechanical principle originally patented in 1910 and later used by New Department of Defense, in its own automatic transmissions. Trans-Trans, believed by many to be the best type of transmission available, was placed on the automobile car because of the large quantity of high-grade steel required. Hamilton-Standard's aircraft application will drive, an exceptional weight saving over currently available constant-speed drives.







**Kaman Designs STOL Aircraft for Navy**

Small convertible flap is the leading edge of propeller rotor, forward and rear. Kaman Aircraft Corp. provides cyclic and collective pitch control in STOL design developed under Navy Request contract. Large Fowler flap in wing and device for additional lift during takeoff, landing and slow-speed flight. Kaman air pressure in before engine. Kaman flap gives pilot full control under 50 mph. Over this speed rotor flap automatically flattens out and conventional rubber, denton and aileron controls take over. Kaman controls aircraft up speed at more than 300 mph. Full scale wingman wing with powerplant propulsive rotor and controls for ground test of lift and control characteristics of system are being built by Kaman under the Navy contract.

strength. Vulcanian also in service and the Vulcan will enter service this year. Official spokesmen emphasized that the success of replacing bombers with graded weapons will be a lengthy one and that there will be a considerable period when both are in use. This will also hold true for manned fighters and cruise missiles.

An example is the F-15s. F-15s, which is being used by the RAF as a

ring of such force to be constructed in the United Kingdom. Forward of this, first will be equipped with the British Bloodhound missile and later with an English Electric weapon, which is in service in more advanced. This is a joint RAF-Naval weapon. No RAF jet fighters are in use but it has not been placed although one is anticipated.

Spokesmen for the Air Ministry and the British government had both "fused" to step up its guided weapons program in the rapid replacement of defensive systems, both missile and manned fighters.

#### Defense Answer

The response for was not reducing expenditure in Britain due to defense cuts.

The spokesman also stated that a defense answer to the ballistic missile which he refused to accept in the "defense" program. "There has never been an alternative weapon yet," he said. The Air Ministry and Ministry of Supply have been studying the problem of defense against ballistic missiles.

It is a forward-looking problem, "the top ranking official stated," but it does not seem inevitable. A great technical effort is needed, however, and that costs money." He declined to give further details.

The ministry spokesman said Britain's decision was to build a successor to the English Electric P-1 fighter or a superior bomber was made such that can be the Air Council on "military grounds."

It is not in doubt a step it might seem he said since "what we have done is decide not to have replacement for aircraft we do not let have."

#### Deterrent Smack

The official emphasized that Britain's defense plan was realistic around the problem of providing a deterrent capable of "overwhelming destruction" in all circumstances. "This is the purpose of the defense and the purpose of the defense is to protect the deterrent strength."

It is possible to argue such a forward and difficult problem on the ground that for one reason he says of "destroying the deterrent," it was stated that to determine plan is to protect the V-bombers and missile bases from air power attack.

The air to surface weapon will be brought into service well ahead of the ballistic missile, the ministry spokesman said, and will greatly increase the reliability of the V-bomber force. This authority, it was declared, it is possible to see the first aircraft powered "stand off bombs" from a range beyond detection by the Russian radar network.

#### Missile Base

RAF now is building its first anti-aircraft missile base at North Gosport in Lancashire. It is to be used for service trials next year. This is the first of a

## USAF Moves to Cut Industry Overtime

By Claude Witte

Washington—USAF and the Navy's Bureau of Aeronautics took steps last week to reduce overtime pay costs in the aircraft industry.

In a directive applying to all aircraft and component procurement with the exception of ballistic missiles, these new regulations were put in effect.

• **Military plant expenditures** on aircraft to be cut only to 25% of the project's total man-hours. Previously, the representative was not restricted.

• **Overtime** is capped at 20% must be approved by management representatives of the Air Material Command or BuAer.

A separate directive governing missile construction is being prepared and probably will be promulgated this week.

It was emphasized by spokesmen for both agencies that the new order does not eliminate overtime where it can be justified for reasons of economy or to meet a critical schedule. A top USAF procurement official described the directive as "a reduction of controls" or so "administrative with less specifics."

The action was blamed upon the rising cost of aircraft in the face of a projected budget. More procurement officials are convinced that the action

in which overtime is not justified and can be eliminated without causing schedule slippage.

Industry reaction was that the order was not too strict but too inflexible. Contractors with production schedules based on the rigid rule are all too often faced the unrealistic necessity of revising the schedule because there was no time allowed to present a justification for the extra expense.

Neither industry nor military officials were able to estimate the amount of savings that will be realized. In the absence of figures on the amount paid for overtime in the aircraft industry, the nearest clue was that the full savings runs to about 45% of the overall expenditures on a production program.

The limit of 25% of total man-hours was expected to eliminate overtime in some areas in order to allow it to continue in others. For example, overtime may be stopped in an aircraft plant's engineering department in order to keep it available for flight test work.

In many contracts, flight test overtime is essential to keep pace with the production unit, particularly after a spell of bad weather.

There was some speculation about the effect of the order on the industry's

schedules with labor. In some cases, overtime pay has become a regular thing and a locked up part of the regular work's income. It is anticipated there may be some job shuffling caused by the cut in pay.

At some plants, where overtime already has been held to a minimum under company economy policies, the new directive was viewed as unnecessary. At the same time, it was pointed out, it will force these firms to increase their paper work when extra hours must be worked.

Another problem was whether paid off ballistic missile manufacturers are permitted to be more generous with the overtime. In addition to attracting employees from other aircraft plants, these companies may have equal pay opportunities if they also make conventional airplanes. Engineers and assembly line workers are expected to prefer work on missile projects if the take home pay is greater.

Small business, as well as the major prime contractors, is expected to need reinforcement under the order. It was pointed out that many shops with limited facilities work a regular schedule to obtain maximum utilization of equipment and manpower.



**Breguet Tests "Blown" Wing**

Breguet's STOL wing planed by Breguet 540 and transport, one in 1000 wing in other members tested gain lift by deflecting inward under wing into downward flow of air. Breguet 540 wing at a walk of propeller. Four Turbo-propellers engine rated at 400 hp. power the design, which at a gross weight of 14,000 lb. including a 70 percent payload, is expected to exceed 1000 ft. Payload is under construction and plane is expected to fly by the end of the year. Breguet is planning a large version, the 540, under the use and powered by four 1,200 hp. turboprop engines.

# Gavin Says Wilson Directive Crippling

By Katherine Johnson

Washington—Ground rules laid down for senior officials and members in Defense Secretary Charles E. Wilson last week may not be enough to prevent the Army from fulfilling its mission, according to Lt. Gen. James M. Gavin, chief of research and development.

In testimony before the House Appropriations Committee released last week, Gen. Gavin said the Army plans a continuing fight to look through the limitations imposed by the Wilson directive (AW Feb. 7 p. 30), like tailoring the aircraft.

• **The \$500 lb. weight limitation** on Army aircraft will impermissibly prevent the Army from developing the aircraft necessary for fulfillment of its mission. The Army must have a light aircraft capable of moving remote locations of use or quarters at will, without the combat zone. The requirements for this sort of transport are such that it cannot be conventionally built, filled with load using aircraft weighing less than 5,000 lb.

• **160 mph cruise limit** for Army aircraft is an insurmountable barrier to Army progress at present, and it is believed that the limitation will be increased when justified.

• **200 mile range limit** on Army aircraft to surface targets is insurmountable. One example of future aircraft requiring requirements for improvement is for it to be based beyond the 200 mile radius radius.

## Helicopter Too Expensive

Gen. Gavin said that unless the 1,000 lb. weight limit on aircraft is lifted, the Army will have to rely almost exclusively upon helicopters to fulfill its mission—and that at an exorbitant cost.

He added:

"In any given payload class a helicopter generally costs at least twice as much as an airplane, and that times is much in evidence. The Army has further indications that the heavier categories of conventional helicopters—above three tons payload—will be extremely difficult to maintain in any sort of useful field condition."

The Army, Gen. Gavin said, wants to get into development of aircraft up to the 5,000 lb. scale.

"Between 5,000 lb. and zero, there is an enormous field requirement," he says, with a slight pause. "I cannot believe more great things could be done."

Gen. Gavin said the weight limits have also had serious effects on the air-

craft industry's interest in developing aircraft for the Army. "I have sensed a decreasing interest in the Army and its aviation program within industry. The net effect will be that the exchange of ideas between the Army and the industry will tend to be stunted."

Under questioning, Gen. Gavin said that while the Army might not press for operational use of a 5,000-mile aircraft, we know we will need engines of 100, 400, 500, or 600 miles.

Rep. George Milner (D-Tx), chairman of the Appropriations Subcommittee on the Armed Forces and Veterans' Affairs, said the Wilson directive limiting the Army to a 200-mile operational radius "really seems very little." The Army, he added, "will continue to work on the program as it believes it should work, without too much recognition of the 200-mile limitation, feeling that it will have the weapons and capability and the equipment—no model probably get what can come out of this area."

## New Testimony

In his Gavin report, that is not explicit: hope. Unfortunately, the facts of life are not quite as rosy as that, and perhaps, more, we are a bit inhibited in that scenario as we are not used to support our program.

Gen. Gavin said that technically, one must realize, the memorandum will be submitted in June.

Chief of Naval Operations, Adm. Arleigh Burke, told the committee that the Navy expects to gradually convert to a ship-mounted system which will in value a substantial method, as before, equipment. The heart of the Navy

project is the Polaris fleet ballistic missile.

Adm. Burke said "insulin will be the major defense of the fleet against attack in about the 1965-67 year. We hope to have enough ships to have a complete task force with nuclear power by 1970."

The fleet ballistic missile is an experimental stage. We do not know how fast it is going to work. We will not know for two or three years. But when it does, it will have a terrific impact on our various ongoing issues.

Adm. Burke said "the first difficulty that we have to overcome is to find the exact location of the launching point to our operational success, but to be supported a great deal."

The second problem is that the policy and practice of the ship has to be taken into account which makes the amount of roll and amount of pitch has to be compensated for in the design. That is a difficult problem.

He told the committee that the Navy will have a "completed job on an interim powered aircraft carrier 'roughly as three and a half years."

Adm. Burke said that he did not get back, as its current aircraft program is very of great interest, development in the Navy.

"Right now, it looks as if we will have a major aircraft for a long time."

"We are planning to utilize in a few years the number of our fighter aircraft in number because capable of replacing them."

## Twining Yaw Navy

Gen. Nathan F. Twining, USAF chief of staff, admitted that the Navy's current aircraft "are half" as good as the Air Force's. He added, however,

"But the carrier is not adapted to that role and that is where the disadvantage lies."

I do not think there is a justification for building carriers to perform the strategic mission assigned to the Air Force.

Carrier forces Gen. Twining testified, "are not only vulnerable to launching attack, but are susceptible to submarine attack as well."

A carrier force is more vulnerable, actually, than a land target.

"Noting that Russia has more jet fighters in operational units than the U.S. Air Force, Secretary Donald A. Douglas added that "moreover, they have produced in the last five years more jets than we have."

SECOND P6M-1 took in Chesapeake Bay. Cause of crash was traced to the effect of experimental horizontal tail modification.

## P6M Crash Study Leads to Tail Solution

Flight tests of the Martin P6M SeaMaster are expected to resume in the late fall, and production of the carrier aircraft, which is now out of way, may be completed by the end of the year.

The following Martin report of the crash of the second prototype, as reported by Aviation Week, is a report that an experimental modification to the horizontal tail changed the load level on the aircraft structure. Overcoming of this aircraft caused the accident.

To provide for the aerodynamic improvement brought about by the tail modification, which is the first time, the carrier aircraft was modified to provide the possibility of overpressure of the hydraulic system on failure P6M, the tail structure of the SeaMaster was changed to support the extra load.

The extra load, however, will largely increase the configuration of the 70 ft P6M-1 prototype. To provide a wider view of the carrier aircraft, the P6M-1 was modified to support the extra load. The extra load, however, will largely increase the configuration of the 70 ft P6M-1 prototype.

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The first of the P6M-1 aircraft is expected to be delivered to the Navy in the spring of 1955.

Navy's second prototype P6M-1 Martin SeaMaster (BuNo 115812), which is the first of the P6M-1 aircraft, was lost in a crash landing at Middle River, Md., on 9 November 1954 at 1745 EST. All four crew members ejected successfully and parachuted to the ground east of Odessa without injury.

small company, both containing Naval vessels who had witnessed the take-off. After being witnessed tests at 5,000 ft, the aircraft climbed to 12,000 ft where two separate openings and changes were performed with the full rotary near clear.

After a climb to 25,000 ft, the ship was put into a slight dive. At about 20,000 ft, a normal recovery to level flight was begun. A rise down pitch was felt by the pilot, however, and the latter carried out a full pull to correct the aircraft. The aircraft then began to respond and climb force was gradually restored.

## No Response

But the climb continued and increased in rate as the pilot applied to the engine power appropriate control (as would be expected). The aircraft did not respond. While subject to a constant gaze, the ship was the first of growth, it continued to pitch up as a right move back.

Pilot of a Navy jet fighter plane, immediately behind the P6M, observed the pitch up to an apparent vertical position. Upon sighting some small unidentified parts falling off behind the SeaMaster, he noticed that the plane was banking up and the crew to report. All four crew members ejected centrally during the loop, after which the aircraft fell into a downward spiral to an estimated altitude of 5,000 ft, where it exploded back, plus, followed by a complete breakup. The wreckage fell among fields and small wooded areas near Odessa.

Approximately 80 per cent of the results in thousands of small parts and 150 major parts was recovered from the crash site, including 50 ft. The wreckage was set up in the operations hangar at the North Air Station, Patuxent River, Md., and involved through by Martin engineers and experts from the Navy, Air Force, Naval Advisory Committee, the Navy, and Civil Aeronautics Board. The accident was attributed to a con-

Martin's record of the contract, and the subsequent development of the P6M, was discussed to Congress on June 1, 1955 by the Deputy Chief of Naval Operations (A-1) as follows:

"The signed contract with the Glenn L. Martin Company called for two P6M aircraft, the first of which made its first flight in July 1953. This aircraft was 'lightest aircraft' only—other words, it did not have the electronic equipment which will be necessary to carry out the mission. As the No. 1 P6M-1 continued with the same phase of flight evolution, flight test data showed rapid or superior performance in regard to the design criteria for such an aircraft."

"Additional production contract aircraft were handled for in the last year 1954 funds in order to have a sufficient quantity of aircraft for evaluation on 1957. A number of P6M-1s were placed on the fleet in 1957; however, it must be noted that it will be a few years before we have these in operational quantities."

On Dec. 5, 1955, after completing over 17 hours of flight time the Number One P6M-1 prototype was lost over the crash site of the Patuxent River near Point Lookout during a test flight. Three Martin crew members and a naval officer lost their lives in this accident. From Dec. 8, 1955 until March 2, 1956, full-scale salvage operations were conducted to recover remains in the Patuxent River.

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leaving type. The majority of the failures which occurred on ground impact. The stabilizer cylinder control valve (acting) had an internal failure at the base of the inner valve port. Although the cylinder was plugged at the rear of the actuator, air in the chamber. However, microleakage and/or small internal leaks reduced the failure resulted from a static load at back up. These findings were confirmed by Aerospace Company of Aerospace testing specialists, as well as by government experts.

#### AERODYNAMICS

The XP6M-1 is the first large aircraft to be designed for high speeds at low altitudes. As a result, the XP6M-1 must be given the ability to withstand loads two to three times as high as are causing aircraft of comparable size. But three factors have opened a realm of unknowns for the aerodynamicist. For the XP6M-1 has been encountered explosive decelerated flight-test in a speed regime where little is known about the aerodynamic forces involved for planes of this size, weight and speed characteristics and where sudden and sometimes unexpected force changes are seen with increasing speed. Further, the aircraft's flight envelope has been difficult to accurately predict the magnitude, direction, and particular flight conditions at which these force changes may occur.

Evidence in the investigation indicates that the possibility of error between aerodynamic calculations and actual flight test results is quite great at the values of flight testing. Particularly in this time as the aircraft such as the XP6M-1 where the so-called "X-factor" control system allows for an "feedback" of forces to the pilot.

#### Feet Eliminated

Design and perfection of such control systems is a necessary forward step in a system program, but it also means development of aircraft in which we are depending on our senses, much the "feet" of aircraft, must be more intensely experienced by the pilot. Loss of the feedback force means an inability on the part of the pilot to report by designation a true indication of what the aircraft has experienced in flight, and thereby adequate is use of adequate and continuously monitored instruments.

Elimination of information data following the accident shows that, in recovering from the dive to the maximum lateral speed, the stabilizer had no a full leading edge down position, resulting in the airplane rapidly turning up to a normal load factor of more than was borne the force of gravity.

As a result a complete re-examination of all flight and wind tunnel stabilizer hinge moment data was initiated, and

dynamic analysis was begun, using automatic computing equipment in an effort to simulate the load changing mechanism, and to investigate large moment variations under diverse conditions.

Configuration of the XP6M-1 as an air flight was not intended as the elevators had been locked in a fixed neutral position eliminating elevator deflection (leading edge up) which results in high speed trim conditions in the normal configuration where the elevators are geared to the stabilizer. With the elevators locked to the stabilizer, the large moments shift in the cross pressure direction, or to the weaker side of the stabilizer cylinder.

Revised calculations, on the basis of corrected data, indicate that, with zero elevator deflection, the stabilizer hinge moments could have approached, in rounded, the maximum capacity of the stabilizer actuator at the maximum speeds attained at the time of the accident.

#### Critical Load

Analyses on the automatic computing equipment have shown that with the elevators locked, the stabilizer system will still continue in the nose down direction after an initial surge, increasing of the hydrodynamic forces. Hence, the evaluation of wind tunnel data and, in addition, the recorded moment stabilizer loads (under locked elevator conditions) indicate the nose being. The hinge moment load was very close to the maximum capacity of the stabilizer actuator at the time that the test speed readings were taken. On a slight disturbance, such as the pilots pulling out of a dive, a gust, was needed to overpower the stabilizer system.

Reference to the loss of the Number One XP6M-1 on the Potomac River on December, 1957, the unusual large moment data in the present accident reconfiguration of the second accident indicate that, at the conditions under which the first aircraft was lost, the stabilizer hinge moments were not an outstanding case of the earlier accident, unless coupled with other factors.

#### FINDINGS

The results of the present investigation have revealed an evidence of any basic deficiencies in the aerodynamic design which might reduce the potential capability of the P6M aircraft to perform its assigned mission.

Given members were the second XP6M-1 at the time of the accident were Robert S. Turner, pilot, William Cunningham, copilot, Thomas Koenig, flight test engineer, and William Corbett, flight engineer, all employees of Martin.

• Accident was lost because of an un-

controllable nose up pitching moment which occurred during a shallow dive at an altitude of about 20,000 ft.

• Horizontal tail control system had been changed in this flight test by locking the elevators in a fixed neutral position. This experimental modification had lateral elevator deflection (leading edge up) which exists at high speed trim conditions with the normal tail air configuration in which the elevators are geared to the stabilizer.

• Accident had been tested an actual previous flight under conditions of Mach number, dynamic pressure, and center of gravity, which equaled or exceeded the conditions at the time of the accident. These previous tests were with the design tail configuration (elevators geared to stabilizer), and no adverse control characteristics had been experienced.

• Stabilizer hinge moment characteristics change substantially at high Mach numbers, and with the elevators locked to the stabilizer, the large moments shift in the compression direction, or to the weaker side of the stabilizer cylinder. Revised calculations, on the basis of corrected data, indicate that with no elevator deflection, the stabilizer hinge moments approach, in round, the maximum capacity of the hydraulic control system at speeds at high as those at which the test the second XP6M-1 occurred.

• Analyses were the accident on which automatic computing equipment had been flown, with the elevators locked, the stabilizer system will still continue for a short time in the nose down direction after an initial small overpressure of the hydrodynamic forces.

• Simple and conclusive evidence was provided by an flight readings at data collecting devices, particularly the accelerometer and accelerometer outputs.

• Evidence that the airplane did not break up until after the pitching moment is provided by 1) statements from the XP6M-1 pilot and the pilot of the air fighter chase plane; 2) the continued functioning of instruments for 55 sec. after the pitching moment; 3) the fact that the major portion of wreckage was recovered in a small area of only a half mile in radius.

• No evidence of pilot error, structural failure, or control malfunction in the flight control control system or the flight control hydraulic system was found.

• No apparent direct connection between the accidents of the Number One and Number Two XP6M-1 in flight tests issued. The evidence reveals that they were separate and distinct in cause.

• Revision of the wind tunnel hinge moment data in the present investigation indicates that, at the conditions under which the first XP6M-1 was lost in December, 1953, the positive static hinge moment data (tension in cable-

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Who just didn't build it? This unusual helical gear for the Shimadzu 2 M helical dynamometer is not on a production basis at Indiana Gear Works although the model in it is around 10 and the intention for possible spacing and such angles are those of a helical gear.

dent were not as striking as satellite gear case of that early accident.

• **Within the flight hours** tested to date, no serious functional, design, or flying deficiencies were found, a fact which has contributed to the accident.

#### CAUSE

The investigation committee has concluded that the cause of the accident was the fact that the engine was running on experimental modification—locked rotors—which changed the lead level on the stabilizer actuator. When the aircraft attained high speed and maximum altitude, from the divert at about 20,000 ft, the large moments acting on the stabilizer overpowered the stabilizer actuator, with the resulting uncontrollable chattering actuator.

#### Maser Development Offers Wider Uses

A semiconductor amplifier device called the Garnet Maser which operates capable of operating over a remarkably large frequency range of 10 mc to 100,000 mc, has been developed by scientists at the Bell Telephone Laboratories and Harvard University.

It operates on principles similar, but not identical, to the Paramagnetic Masers recently announced by BTL and the Multichannel Institute of Technology (AIEE Feb. 15, p. 67). Besides, the new device can operate at room temperature instead of the extremely low (near absolute) temperatures required for previous Masers.

The characteristic of the device's operation is that it can operate at room temperature without the need for any external magnetic field or any other type of external field, but a higher when specified at room temperature.

Another significant advantage of the Garnet Maser is that it can be operated as both a continuous wave (CW) and pulsed amplifier without some Masers are limited to pulsed operation.

Credit for engineering the Garnet Maser is given to Dr. Harn Seki of BTL, by Dr. C. L. Huges of Harvard who independently made the same discovery at a slightly later date. Dr. Huges said the new device has "very exciting possibilities." Although considerable engineering problems remain to be solved, Dr. Huges believes that a complete industrial application could produce prototype models within six months if work is started at once.

Under Air Force sponsorship, the work has been investigating garnet materials. Of the dozens of possible compounds, it appears that such a low will prove suitable for Maser use, Dr. Huges

says. One of these which appears most promising is a combination of vitreous oxide and iron oxide, in proportion of 1:5. The mixture is sintered under high temperatures to produce the Maser material.

Asked about the gain and bandwidth of the new Garnet Maser, Dr. Huges says that the device against some other like a superconductor resonator where the gain is dependent upon the stability required. However, he believes the device should be able to provide at least a 10 db gain with reasonable stability.

Garnet Maser bandwidth at lower frequencies, around 100 mc, should run about 1-2 mc. Very little is presently known about the relation of bandwidth to operating frequency and bandwidth may prove to be relatively independent of operating frequency, Dr. Huges told Aviation Week.

One possible limitation of the new device, when operated at extremely high frequencies, is the requirement that its power source must be at a higher frequency than the input signal which the device is to amplify.

#### Large Solar Furnace To Be Built by ARDC

**Hoffman ARDC, N. M.**—Large solar furnace capable of producing temperatures between 5,000 and 5,500° will be built by USAF's Air Research and Development Command in the Sacramento Mountains of south-central New Mexico near Grantsville. Target date for completion is early 1959.

Described by ARDC as the "world's largest" solar furnace, the facility will be employed primarily to study the effects of rapid temperature changes on materials used in aircraft structures. Management of the furnace will be

taken over by Hoffman Air Development Center. It will be available to the AF, AFOS, Atomic Energy Commission, National Aeronautics and Space Administration, industries engaged in development work and the Air Force.

The facility will be composed of three basic parts:

- **Heliostats**, the mirrors, an reflecting mirror, which will be 120 ft high, 100 ft wide.
- **Parabolic mirror**, which collects the sunlight and concentrates it onto the focal point.
- **Attenuating shutter**, a reaction blade type device which regulates the amount of sunlight traveling from the heliostats to the parabolic mirror.

See more articles the heliostat and are related to that of parallel to the ground. The parabolic mirror also collects the sun and reflects them to the focal point of the paraboloid. In this method, the energy can be increased from 0.15 to 750 watts per square centimeter.

The furnace will require a staff of approximately 100 persons to be supplied by Hoffman and civilian contractors. Development of the design theory is to be used by Dr. Paul D. Jones, director of Hoffman Air Development Command's Materials Branch.

In another development, Hoffman Electronics Corp., Los Angeles, established a Solar Research Division at Evansville, Ind., which will be concerned with the development and production of solar energy converters. It will operate as a part of Hoffman's Services for Defense Division.

Company also has set up within its subsidiary, Hoffman Laboratories, Inc., a new department for research and development of semiconductor applications, called the semiconductor equipment design section of Hoffman Laboratories. It will develop apparatus using all types of semiconductor.



Two ARDC scientists, Dr. Karen McIlhenny and Dr. Paul D. Jones (right), view furnace model.



AB-4 being hoisted by All American's turbo-cat (bottom plane) has short takeoff run



TURBO-CATAPULT under construction. One of six Allison J33s used is shown at left

## New Catapults Developed for Navy

Two new devices have been developed for launching planes in minimum distances.

One is designed for use on short, load-bearing strips being operated by the Marine Corps. Called a turbo-catapult, or turbo-cat, it uses jet engines to launch jet (and piston engine) planes into the air in one-fifth of their normal takeoff run. Device was designed and constructed by All American Engineering Co.

Other, developed by Navy contractor and called an Inertial Conductions Catapult Propellant, is designed to produce and maintain greater launching pressure at faster rates than the catapults are in contrast according to the maker, Reaction Motors, Inc. HCCF will be installed at the Naval Ship

station Test Facility, Naval Air Station, Lakehurst, N. J. for a five-year development and evaluation test program.

All American's turbo-cat launcher, which develops 50,000 hp, is a one-half mile, the weight of a comparable vacuum catapult. It was recently demonstrated to Navy Bureau officials at the company's test facilities at Georgetown, Del. First plane launched was a piston engine Douglas AD-4NA, first jet used on the device was a McDonnell F-4H Banshee. Pilots of both planes stated that the launcher provides smooth acceleration to take off speed.

Turbo-cat's big asset is that it is easily dismantled for air transportation to fields where it is needed. Also since it uses standard jet engines it presents

### Vanguard Tests

Perkins AFE, T10—Two stages of the three-stage turboshaft rocket was fired for the first time in the Vanguard test program here last week. Navy did not fly clear here for the rocket until before falling into the sea. Peak velocity was 1,100 miles an hour.

Meanwhile, the Martin Co., Vanguard prime contractor, announced acceptance of a faststage engine from the General Electric Co. The unit will be tested at this base within a few months, the Navy said.

as sophisticated maintenance problems, and will operate on sea engine fuel available. Maintenance of the engine and its parts is being kept in line with maintenance of a submarine. It will launch any aircraft equipped for takeoff operations without any modification. The device consists of six turbo-cats arranged in a circle like a six-pointed star with the engine's exhausts pointed outward. "To catapult a plane, the engines are brought up to a good, sustained rpm, then a jet gate is actuated which directs the exhaust gases to impinge on one of two centrifugal-placed launchers. The turbine supplies the power to launch the aircraft through a chain and cable system which leads a shuttle along a track as the turbine. Force is attached to the shuttle by a carrier-type device.

Used in conjunction with All American's "Water Supercat" according to the General, the turbo-cat can make, at least, any air strip a potential jet base.

### Pace Named President Of General Dynamics

New York—Frank Pace, Jr., has been elected president of General Dynamics Corp. and retained vice chairman of the board. The firm's head of division in their military line has work also in aircraft. John H. Hopkins head of division and named Earl Collins Johnson executive vice president.

Pace, a former Secretary of the Army and now Director of the Budget, joined General Dynamics in 1951 as executive vice president and was elected first chairman of the board in 1959. Johnson, a former Undersecretary of the Army and a recent president of Air Transport, is assumed as 1961 become senior vice president-operations and fiscal affairs of General Dynamics.

Hopkins, the corporation's treasurer and its president and vice president, is assumed to Georgetown University Hospital in Illinois.



B-47 TEST bed for General Electric engine has done for extended in being moving into left field with thrust changes

## Test Bed Layout Dictates B-47 Changes

Milwaukee, Wis.—Structural modifications of a Boeing B-47 test bed for the General Electric engine included reworking nacelles and engine's components, the bomb bay and dorsal fin, and attachment of the engine pod itself by a slightly "new side" prism to reduce buffet.

Several engine features were considered, but a major design factor for the new nacelle was that it left no growth structure on the wing, or jet blast aft, thus reducing possible structural damage from engine. Rejected or extra included changing the engine under the wing, placing it on one of the present 147 pods, joining it to the bomb bay or behind in the fuselage.

Chief of the nacelle pod and pylons was given careful attention to cause the best effect or results in performance at the aircraft.

Side tests covered wet before and after the conversion indicated that, in fact, the installation had slightly reduced wing natural frequency and had changed the pressure, structural load pattern. Direct flight test program established the aircraft performance envelope.

Effect of the pod and pylon shape was determined by three level series of wind tunnel tests at the Boeing Transonic Tunnel, Wichita, Kan. The General low speed tunnel at St. Louis, Mo., and the University of Wichita low speed tunnel.

Modifications of the aircraft structure included:

- Reinforcement of existing fuselage frames, longerons and ribs on the aft fuselage to handle the weight and thrust of the engine.
- Removal of bomb bay and forward section that tends to make room for instrumentation and wiring.
- Extension of dorsal fin to allow passage of wing forward of the aft field axis.



SLIGHTLY "new side" prism to reduce buffet attached engine pod to fuselage

About 300,000 ft of wiring is required for the instrumentation.

Construction of rack in the bomb bay to cover the nacelle apparatus.

The bomb bay rack was constructed so that it could be easily lowered to the ground for accessibility by means of a truck. In addition, a small plane was used to make sure the engine pod was installed in the nacelle.

Engineers are aware of an explosive nature burning away from the close proximity of the fuel tanks.

The following equipment was installed:

- Transponder logger, manufactured by New Laser Systems of Del Mar, Calif., to record specifications. This unit is capable of recording 300 test parameters in a period of 10 sec with an accuracy of 0.1%.
- In record is made on a C.E.C. magnetic tape recorder Type 570135.

Since this system was modified, considerable interest has been expressed by several American aircraft companies.

Pressure logger manufactured by Wanda Engineering Co. of Los Angeles also is on a C.E.C. specification. This unit is capable of recording 70

parameters in a period of 10 sec with an accuracy of 0.1% and its record is also made on the same magnetic tape unit with the transponder logger. Tape meter system designed and constructed by General Electric to record 5 channels of engine compression blade vibration. Two oscillograph pods are used as follows:

- Pack No. 1, 36 channel C.E.C. type 5119 recorder and oscilloscope equipment to be used to record engine parameters to an accuracy of 2%.
- Pack No. 2, 26 channel C.E.C. type recorder and oscilloscope equipment to record pressure engine overall vibration.

Two photo recorder units were designed and constructed by General Electric are being used primarily for system analysis and ground position once where a high degree of accuracy is not required.

All this instrumentation is automatically controlled so that the observer need only initiate the cycle. The manual work can be conveniently made but at the direction of the observer by individual switching of the units.

## Tighter Air Control Drive Gains Force

By L. L. Dotsy

As Traffic Controllers Are charged that the suggested plan is "permeatic." The researchers find that too stringent a positive control enforcement may lead to the traffic jams that already are causing these instances of delays and cancellations, particularly on the high demand routes and terminals areas within the New York Washington Chgo area.

Here are the major gaps in the present survey database that Arizona WILCO found to be the leading causes of slow-downs in the overall flow of traffic:

- **Lack of video coverage.** Some cities such as Detroit are without video. In such cases, outdated standard ANC closures are used to handle traffic movement. Chicago is equipped with TPSS units but handles only the decongestion phase of traffic control by video 16 hours a day.
- **Controller shortage.** The New York and Washington centers are now well equipped with video but because of significant staffs of trained personnel

- Lack of bypass routes around heavily congested areas. All traffic for example, is now fed through the highly congested area of Detroit because space allocated to serve its hinterland, is not used for its own benefit. Field facilities, personnel present use of resources that circumvent Detroit. Airlines are asking for the addition of a bypass route between Superior, Niles, and London, Ontario, is a means of decreasing through traffic from Detroit.

Underbitt plans, CAA has asked established positive control of traffic above 24,000 ft and plans to lower the limit to 15,000 ft by January 1995, or all federal routes (AW April 1, p. 47).

The Aviation Facilities Planning Group headed by Presidential Advisor Edward Costa has recommended positive control above 15,000 ft and coordination of IFR and VFR traffic that land through the use of multiple one-way arrival separated runways and taxiways (AW April 29, p. 47).

The authors have formed an approach toward positive control in five stages: a gradual modification of present procedures. ALPA, on the other hand, has proposed hard (unmistakable) control as simple as the light at the end of the tunnel.

delays in flights may be encountered during the first few days of July if the new passport goes into effect on July 1.

ALPA concludes that 1,000 on top VFR flights may continue during the early phase of the introduction of IFR procedures. But the group is convinced that the present airspace system can

The routes based on a speed record that flights on the same altitude between New York and Washington are operated by as much as 12 airlines, permitting but one on route flight between the two points of air gateway.

The CMA has also launched a high-speed training program for controllers that has won praise from the Air Traffic Controllers Assn. The program, tied with an increased recruiting campaign, would solve the controller shortage in some areas, although one controller

Most CAA effluents, however, over the entire day have expressed a well-defined circadian rhythm.

Deless, Cited

■ **Narraville 25** Between midnight, reported crashes 1,500 and 2,000 ft ranging between one and two miles. At 5 p.m. the fire advised that traffic made two hours and 10 min to both Malibu and Ojai.

- **November 15:** Chicago reported broken down an average of 5,000 fire trucks or better. The first national flights to be delayed for hours.
- **October 31:** Between 4 and 5 million people in the United States were expected to get drunk on Halloween.

The acceptance rate of a report probably can be the primary cause of the commonest instances. Most groups are confined to railway stations and a narrow, available list of

The Detroit (Wittke has a house) mafia on probation is depicting sanitation as the latest voracious fly-by.

et. although agrees to put Oct. 1 as the target date for the agreement, facilities

Many are on the Solihull District Council's list of places where they can be found. They call for consideration from the Victorians' RAPCON and the DfT. This means that on flights through the area without altitude by the Solihull.

Also on Victor 54 is a radar tower at all altitudes, 14,000 ft, and 18,000 ft.

Amesbury Valley and the sedimentation of the Solingde to the south is a 100-year time period terminal area. Both National Archives have a branching of through the heavily congested

Weather: Be-  
at 1,600 ft.  
and visibility  
within 100 yd.  
advisors were  
warned.

## Northeast S

On August 2, the C. executive session to grant Northeast Although C. was not made public until these was a sharp upswing stock transactions on A.

Arduos authorized to  
twice New York and Wa-  
been convinced since that  
the rest to come. The

the Detroit RAPCON is of traffic

**IL-6 Increases**  
Instrument approaches  
the CAA have increased  
to 67,800, 27% dis-  
tinct from. More than 50  
flights are under 200  
feet, 200 to 299 ft, 300 to

the proposed  
arrangements  
of the Detroit  
city streets

Most on-site IFR parties between pilots that sufficient volume of the VFR.

Chicago-Madison Airport to hold that place in the aircraft operations handled that town during 1976.

Field was worked in hours and aircraft operations a time in fourth place closely place Los Angeles, Inter-

## Northeast Stock Leak Probe

Snodgrass is illiterate in a Greek, approximately 500 in August 2, the trading party down on August 3

Information that Delta would not be given the York route was telephoned at 8:30 a.m. on August 7. Griffith, assistant to the Delta, Griffith said he was informed late in the evening from Robert Olaf, a Washington Ins. Envt. Neil, which represented New York-Mingo.com.

Opening the northeast  
Northeast steel case. See  
see (D) Work 1, section c.





## HEAT TREATED TITANIUM

...helps the Hustler spread its wings

**The Plane:** The US Air Force's devastating F-4H Hustler, made by General—Fort Worth. To achieve maximum speeds, designers had to make optimum use of all materials, maximizing strength, weight, high temperature performance.

**The improvements:** F-4H titanium alloy, furnished by Mallory-Sharon, was used in certain applications as a direct substitution for steel for wing fittings bearing heavy loads. This alloy, weighing 40% less than steel, has equal or superior strength for the best treated condition.

**The Service Need:** The Hustler is the first major application of a new technique that extends titanium usefulness.

—best treating. The alloy material is supplied in a medium strength level which permits use of rough heat treating. Then the post-heat treated condition is modified to the high strength desired in service.

To help in the development, Mallory-Sharon service engineers recommended and assisted General in establishing qualified subcontractors who furnished bar stock to their companies for

aviation, recommended furnace type, conditions, temperatures, and heat treating times. We performed mechanical and chemical tests to have an effective treatment, to guide the phase of the program to a successful conclusion.

**The Result:** Improved performance, America's first supersonic bomber. The Mallory-Sharon's outstanding involvement in your applications of this new metal. For information, write Dept. D-5.

**MALLORY  SHARON**

MALLORY-SHARON TITANIUM CORPORATION—MILES, OHIO



until 1975 by using maximum lifts to increase speed by 28 mph with an increase in horsepower, then experts to build 1175 miles miles in six years number of flight hours.

Scheduled extra services (e.g., an overhaul) were eliminated and these were looked into when business was needed.

When accounting studies showed that flight operations were being conducted at a loss, higher freight rates were established. The fact that, though the CAB has ruled back, part of the reason, was less freight and more flight revenue with the all-freight fleet reduced from 1960 DC-1 cargo planes to two.

Allegations got 20.9% of its revenue two miles from flight in 1956, a higher percentage than any other U.S. carrier operating both passenger and cargo services. Because of this, however, freight produced only 13.9% of its operating revenue, a figure it has and no justification of its bid for higher freight rates.

Sales promotion and traffic handling activities are consolidated in one department, with all of the handling subject to the designs of the sales department—recognizing that a united unit is your most effective sales agent.

The integration, Levin feels, reduced the tendency toward conflict between the sales activities. They had developed at one station to the point that the sales and traffic managers hardly spoke to each other.

Sales selection was divided so that promotion manager, local agents and among local island merchants were handled separately in recognition of significant differences sales techniques required to reach the two groups. Local trade promotion, about two-thirds of the sales volume, took care of itself.

Efforts to attain narrow, more attractive service led to such steps as expanding its on-boarding to be of the interest to most elderly persons, with an emphasis on the selection of a new-selling line that need to apply at all times in flight, extension of hours for morning reservations, establishment of a new menu for afternoon reservations.

All jobs in the company were analyzed and a complete reorganization created, with a number of changes in corporate personnel.

The purchasing and sales departments were consolidated.

An office of economic control and a modern budget system were installed, with more operations of the company placed on a dividend budget and effectively follow up procedures established.

A production control group was set up in the maintenance department and began establishing standards relating to maintenance efficiency.

A number of supervisory jobs were

eliminated in order to prevent duplication and overlap.

Current maintenance operations, now apparently bought from Eastern Air Force Base with contracts obtained for overhaul and repair of accessories, engines, and certain aircraft, and for painting and painting aircraft at Tullahoma.

When Eastern finally had no one working in this field, it has 92 employees in contract maintenance now serves an average of 24 in 1956.

## Executive Salaries for 1956 Reported by Airlines to CAB

Reports of officers' and directors' salaries for calendar year 1956 in filed with the Civil Aeronautics Board for the following airlines are:

### Eastern Air Lines

**E. A. Kitchener**, chairman of the board, received salary and director's fee of \$10,000 salary and \$1,000 director's fee. **E. A. Kitchener**, president and director, received \$10,000 salary and \$1,000 director's fee. **E. A. Kitchener**, vice president and director, received \$10,000 salary and \$1,000 director's fee. **E. A. Kitchener**, vice president and director, received \$10,000 salary and \$1,000 director's fee.

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and the work volume is still increasing.

Levin gives much of the credit for Eastern's changed outlook, which he calls the "best and longest," to the executives gathered around him.

The other industry Jack C. Tobin, vice president for sales and service, Ben A. Gable, vice president for marketing and leasing, D. Marshall, vice president for operations. All three moved into their present jobs after Levin took over with Tobin coming over from United Air Lines.

## Executive Salaries for 1956 Reported by Airlines to CAB

Reports of officers' and directors' salaries for calendar year 1956 in filed with the Civil Aeronautics Board for the following airlines are:

### Northwest Airlines

**R. W. Spence**, president, received salary and director's fee of \$10,000 salary and \$1,000 director's fee. **R. W. Spence**, president and director, received \$10,000 salary and \$1,000 director's fee. **R. W. Spence**, president and director, received \$10,000 salary and \$1,000 director's fee.

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ECONOMY · COMFORT · RELIABILITY · SPEED



ROLLS-ROYCE  
AVON  
TURBO JETS

ROLLS-ROYCE LIMITED, ENGLAND, SCOTLAND, CANADA, AUSTRALIA

### Lufthansa Convoys

Two new Boeing 480s en route to Germany for Lufthansa European service are shown at New York International Airport. Flights were flown by the airline from San Diego via Kansas City, New York, Geneva, Rome and Koblenz.

Pan American World Airways

### Carbon Alliances

M. K. Sadiq, president and director, Int. 503 salary; P. Saravanan, vice president operations, Int 516 salary; M. P. Suresh, chief vice-president, Int 438 salary.

### Flying Tiger Line

W. B. Ischery, chairman of the board of directors, \$100 salary; E. W. Farnsworth, president and director, \$12,000 salary; E. E. Baughin, vice president-research and development, \$10,000 salary; E. Weinmann, treasurer; vice president, \$10,000 salary; J. H. Buchanan, secretary and assistant treasurer, \$11,000 salary; E. C. Marshall, dir. vice president, \$10,000 salary; A. T. Chace, director, \$1000 salary; A. J. Cresswell, director, \$200 salary; W. C. Con-



## A NEW STAR FOR ALL-WEATHER FIXES



## EDO AIRBORNE LORAN



For Cockpit  
Installation  
26 Pounds  
Total Weight

Compact, rugged, and rugged control designed for cockpit installation. 30 tube receiver (not shown) occupies 18.475 inch.

### FEATURES OF THE EDO MODEL 345

- Coast, range, easily read over entire bright light receiver. Clear and simple in instrument panel, or after dark with spot.
- Non-magnetized permanent magnet gives directly read solution to problem. No calculations, no tables, no special training needed to operate.
- Loran receiver including 30 tubes. Features low power consumption—only 175 watts, 115 x 400 cycles, 50 watts, 115 x 400 cycles.
- Modest pilot control by special receiver control.
- Highly accurate voltage regulation for dependable operation.
- Complete full-scale feature.

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The **Edo** Corporation

College Point, Long Island, New York

Member of the **Edo** Corporation  
A Trusted Line of Marine and Airborne Electronic Equipment

Now, the long-awaited aircraft Loran, designed primarily to fill the needs of transoceanic flying and packaged for cockpit installation, is announced by EDO. Built specifically to meet airline requirements, this new lightweight unit is designed for instrument panel mounting, convenient to the pilot.

It's no longer necessary to pay a heavy weight penalty for the added safety and convenience of Loran gear. Edo's new unit weighs only 26 pounds completely installed.

Based on the highest electronic standards, the Edo Model 345 gives quick, directly read time difference readings for accurate plots in a matter of seconds. No calculations, no computations, no tables, no special training needed to operate. As simple to use as any other pilot-operated radio instrument.

A development of Edo's years of research, design and production of dependable marine Loran sets and other high performance electronic equipment, the Model 345 contains the latest automated circuitry. Its compact remote control console and clear, easily read 3-inch scope fit neatly into the restricted space of an airplane instrument panel.

If you are interested in detailed specifications and operating data, please write for particulars.

are also present. \$10,410 salary. J. P. Davidson, director, field sales, J. & W. Marlowe, executive vice president, \$10,115 salary. B. H. Kibben, vice president, \$10,410 salary. F. H. Kibben, vice president, \$10,410 salary. A. W. Newman, vice president, \$10,410 salary. C. A. Venn, national sales manager, a member of the new staff. National sales unit, \$10,410 for a unit and service. J. H. Davidson, executive secretary, \$10,410 salary.

### Airline Control Airlines

Airline Control Airlines is a partnership. No minimum were indicated.

### Allegheny Airlines

A. G. Brown, executive vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary.

### Southwest Airways

A. H. Brown, executive vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary. B. H. Kibben, vice president, \$10,410 salary.

## Unit Formed to Ease Gander Traffic Jam

New York—North Atlantic operations appear set back to establish a traffic schedule coordination group at Gander in a voluntary effort to ease the traffic jam threatened by this summer on the busiest peak route. The move is to forestall a threat by the Civil Aeronautics Administration and Canadian Department of Transport to impose flight controls unless the airlines voluntarily work out improved traffic scheduling.

Under the new plan, North Atlantic carriers will file flight extensions by file type several times in advance of flight time, group delayed routes and objectives. As air traffic coordinating group in Canada, consisting of representatives of traffic controllers and meteorological personnel, will analyze these flight extensions for potential conflicts in flight plans.

When such conflicts are detected, the group will advise the carriers as to which and also give them recommendations for resolving the conflict. However, the group will not have authority to order other operations to change its flight plan.

The coordination group is the result of studies by North Atlantic air carriers of their growing traffic control problems. These studies revealed, for instance, that 40% of the North Atlantic flights in the summer are delayed to arrive initial flight plan because of conflicts, also considerable effort has gone into planning optimum route and altitudes.

In some instances the conflicts are between two aircraft of the same operator.

## AIRLINE OBSERVER

Airlines have agreed upon a four-month site in Chicago for a proposed consolidated passenger terminal after considering 10 other locations during the past few months (AVW No. 35, p. 47). Chicago airlines executive headed by United Airlines Vice President Cerber Bailey will begin negotiations with a group of business executives who have offered terminal space in a new building to be constructed on the proposed site on the west side boundary of the Chicago Loop.

Airlines also have agreed to accept interest payment and bond collateral on \$80 million systemic bonds to be issued for the development of Offshore International Airport in Chicago. Plans call for expenditures of funds by 1960 to permit transfer of most airline flights at that time from over-crowded Midway to Offshore. Approximately \$80 million will be used to add a second runway, to triple gate space and increase the size of the Offshore terminal. Some \$10 million will be used for other large construction. An additional \$25 million for airport improvement will be applied by the city of Chicago for further airport improvement in a proposed bond issue to be submitted to voters at the June 5 judicial election.

Schweizer-Belgian World Airways has increased its Bessilair helicopter service from five to five roundtrip flights daily except Sunday when only one flight is scheduled.

United Airlines will eliminate two-way flight lifts on all flights this month. Lifts will be replaced by a monthly, full-scale, full-scale distribution. The magazine, which will feature general interest travel articles, sports, latest and latest program stories, will be presented in two packets together with flight reports. First edition will not approximate 200,000 copies, but the airline anticipates a substantial increase in volume in subsequent editions.

Postmaster General Arthur Wrenschfield met the Post Office in increasing the number of offices and trucks for mail delivery. Mail carrying times have decreased from 10,000 to 2,000 during the past 15 years, today more than 10% of U. S. post offices cannot be reached directly by train.

Trans World Airlines will seek contracts for the overhaul of military passenger aircraft at its Kansas City overhaul base. In a four-point cooperation program presented to Missouri state leaders, TWA President Chester Burgess said the plan would increase efficiency of the Kansas City base, increase local employment and free military maintenance personnel for jet and missile work. Burgess also asked for support in obtaining a \$500,000 increase, a proposed new route from St. Louis to Miami and a closing of the Pensacola-Zephyr gap on its international route.

Air Line Pilot's Union has filed formal complaints with the Civil Aeronautics Board against American, Eastern, National and Trans World Airlines for publishing "untrue and unbalanced" flight schedules. ALPU charged the four carriers with publishing "untrue and unbalanced" flight schedules, which are inaccurate, misleading and unbalanced in its constructive practice. The union added its studies indicated worse flights failed to operate according to schedule. "You can see on a map of a month."

American Airlines will expand its Tulsa overhaul base to handle maintenance and overhaul of its forthcoming fleet of 30 Boeing 707 jetliners transports and 55 Lockheed Electra turboprops. The Tulsa facility is American's principal overhaul base for aircraft, engines and accessories.

National Airlines will begin Channel 10 TV service next month over its Miami WFTS TV public service television station. Planned telecasts have been moved about by three months in a move of National's purchase of local, three radio facilities of WFTS-TV. WFTS-TV Channel 25 in Miami. These facilities will be used until the station of WFTS-TV are completed. WFTS-TV is being constructed at Channel 10 station was 100,000 sq. ft. The Federal Communications Commission on Feb. 8 to Public Service Television, Inc., a wholly owned subsidiary of National Air Lines.



TOWERS OF MANHATTAN from a landing for French Alouette helicopter (above) which Republic Aviation Corp. is licensed to manufacture as U.S. Republic. Bright on Alouette (below) is U.S. Sikorsky at American Helicopter Society meeting in Washington this week. Top helicopter is equipped with flotation gear.



## Alouette May

New York—Republic Aviation's version of the offshore powered Alouette II appears to be a serious contender against Bell Helicopter's XH-40 for U.S. Army's utility helicopter requirement.

The French single-engine helicopter, licensed by Sikorsky for manufacture here by Republic, was demonstrated recently here. Republic plans to increase power and make other changes to suit Alouette's performance which would enhance its competitive edge.

Bell's turbine-powered XH-40, which carries six passengers, is undergoing Phase I flight testing at its Ft. Worth plant (AW March 16, p. 69). Second of three experimental flight test models and seven YH-40 service test models are in order.

Republic also appears interested in Navy competition, where Korea (HUS-1) has a development contract (AW Feb. 11, p. 34).

### Continental Licensed

The Alouette II is powered by a Turbomeca Artouste II 500-hp turbine engine developing 350 hp at takeoff with a continuous performance rating of 317 hp.

At 10,000 ft. gas turbine furnishes 270 hp, covering ceiling, cruise and climb. Contracted Artouste and Engineering Corp. is licensed to manufacture the engine in the United States.

Plans are that Turbomeca will ship Artouste engines of approximately 317 hp to Continental, which will then convert them to U.S. standards, change fittings, make other changes to bring engines up to 425 hp.

Continental then will ship the Artouste engines (Continental Model 229-2) to Republic for installation in its airplanes. If desired, warrants Con-



UTILITYMAN layout is evident in cabin, which has bench-type seat for passengers in line pilot. Rotors at 52 in. wide and 52 in. long.

# AERONAUTICAL ENGINEERING

## Compete With Bell XH-40

tinental will produce the 425 hp engines for the Alouette.

Continental will establish a spare and engine overhaul shop nearby to the one Bell Helicopter maintains for its Bell helicopter for Vietnam bases in Canada and the United States.

Additional Republic plans call for installing a 600 hp Continental Model 219 (C-14) in the Alouette to meet U.S. Army last-ditch requirements for operations at 550-6,000 ft. altitude conditions.

Continental is ready to tool for this program.

Another Republic change calls for rotating power to six sets 90 degrees apart. Present Alouette II's have no lift during hoverability, which results in a high-pitched, compressor noise that can be annoying to people nearby. For up vertically, the rotor would need some downward lift to be beaten down by rotor demands and thus have noise reduced.

### Alouette III

Sad Aviation now is building a prototype of Alouette III, a seven-passenger helicopter with a turbine of 100 additional horsepower. Company expects to have it in production by 1975.

It also has in the design stage several larger models, including a triple turbine-powered, 37-passenger type.

Current orders for the Alouette II total more than 150 for the French military services, with about 40 going to the French army and the rest to the

French army. Portugal is getting 2, Spain 1, Switzerland 1 and Germany 2. Some of the latter already have been delivered, all are believed to be for the military.

Other orders have been placed by Sweden and Venezuela.

Sad is negotiating contracts for about 70 Alouette II to be delivered to Brazil and Argentina.

Current Sad Alouette production includes two prototypes, three preproduction versions. Number 68 Alouette was rolled out recently and those discussed at New York were numbers 52 and 53 of the production line.

The present two of the two helicopters is sponsored by Republic. It will let commercial prospects as well as the military, and will visit Gulf Coast areas for demonstrations in all areas of corporate and operator.

### Pilot's Opinion

N. Y. Army pilots who flew the Alouette and they were much impressed by the helicopter's stability, low level of vibration, compared to other-powered rotor's maneuverability and handling. The French pilots demonstrated the aircraft under the shape around as an incoming and handling maneuverable in low level off the ground in gusty weather. They flew close to bridges and ground vehicles without warning.

Alouette operators claim there is a total of 5,000 ft. on the helicopter without a single use of engine failure.

### Alouette II Specifications

Dimensions and weight	
Length	51 ft. 8 in.
Width	7 ft. 6 in.
Height	9 ft. 6 in.
Empty weight	1,812 lb.
Useful load	1,450 lb.
Gross weight	3,260 lb.
Performance	
Cruising speed	110 mph.
Range	1,545 miles
Endurance	3 hr., 35 min.
Consumption	40 U.S. gal. per hr.
Maximum ceiling	over 30,000 ft.

- Times between overhaul to be
- Artouste engine—100 hr. Expect to go to 500 hr.
- 200 hr. for all mechanical parts—gear box, transmission, etc. About 500 hr. is in a gearbox now in a lab test run.
- Rotor blade life is now 300 hr.

Specific fuel consumption of the Artouste engine in the French-built Alouette II is 91, compared with the 97 of the Americanized 425-hp version. Increased power will be provided without increasing weight. Continental says. The engine weighs a total 245 lb. with accessories, 235 lb. dry.

Main rotor is of dual spar construction. Made a hollow, spar being filled with Molybdenum, a flame plastic mounted into the blade under pressure. Blades are hermetically sealed to prevent leakage.

Single blades are not replaced, the



BULETS of Alouette rotor would be rolled 90 deg. upward by Republic in U.S. version.



CABLE dampers hold 130 deg. Mole assemblies. Fifth sets run from cross plate to hub.



TAIL ROTOR uses a conventional seven-spoke pitch control. Blades are hollow metal.





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possible water with the highest output of power.

The Soviets are looking forward to the advent of the thermometer meter which would enable space flight.

As a compass, Soudien pointed out that the TM-61C requires 150 inches of aviation gasoline to fly from Moscow to Vladivostok at 500 mph, where a similar result could be lost 70 to 75 grams of fuel for the same distance and speed.

Whether Soudien was simplifying the subject considerably for foreign readers, or whether the few technical details were based on actual Russian development was not indicated either.

## Instrument Testing Tool Slows Vibrations

Seattle Engineers in Boeing's Plant, Los Angeles Division have developed a tool to check and standardize testing instruments used in the Boeing guided missile.

Instruments which detect and control Boeing are tested and calibrated on vibration machines.

Shifting his to be corrected in the instrument being tested and light conditions smoothed.

Engineers John B. Patton and Raymond D. Johnson used 5,000 lb. of concrete to aid in solving the problem. The concrete triangle, weighing 11 tons, is suspended on air supports around coil springs inside a steel frame.

Vibration is measured in a large cage inside the concrete triangle. Deposed housing of the vibrator places it at a point which is both the center of sus-

pension and gravity. Called "Seismic Mount for a Vibration Calibrator," the equipment controls elements on a vibration shaker except those that and below 15 cycles per second. Vibrations ranging from 1 to 2,000 cycles per second allowing a force 10 times that of gravity can be generated.

## Martin TM-61C Matador Phased Into Squadrons

Martin TM-61C, now termed the Matador guided beyond tactical missile, was Feb. 11, p. 52, is now being phased into operating squadrons by USAF. TM-61C probably incorporates an inertial guidance navigation system and has substantially longer range than earlier versions of the Matador. Martin says the navigation system has a "high resistance to electronic counter measures" and provides for complete all weather operation of the missile. Approximate cost: \$68,000 per missile.

## Titanium Demand Forecast To Decline, Rise Again

Decline in demand for titanium will probably be 1955 was predicted at meeting of NATO technologists by Dr. R. J. Jeffrey, Battelle Memorial Institute technologist. Cases will be shortening of production of current jet engines, which use bulk of titanium production for compressors. However, in 1960 demand should increase again with production of advanced aircraft in Mach 2.5 and Mach 3 class using high percentage of titanium.



**"PAPA"** The Martin Matador TM-61B is the fourth generation of a famous family. As the latest descendant of the first operational tactical missile in service with the Air Force—and the first precision bomber having complete interchangeability of parts—the performance, operability and advanced engineering of the Matador give it top rating in our missile arsenal. Today, this important weapon is one of five major Martin projects in the field of rockets and guided missiles that are under development or in production for the Army, Navy and the Air Force. It was the original Martin Matador, papa of them all, that launched the new age of missiles in America.

**MARTIN**  
BALTIMORE DENVER ORLANDO



ROMAX vibration shaker test guidance control instruments for Boeing missile.

# J57



## The J57 is a big know!

This turbojet engine weighs more than 3,000 pounds, develops more than 15,000 pounds of thrust, has thousands of parts—one of the smallest of which, a fuel nozzle seal, you see here.

But what do these figures really say about the J57 as a whole? Do they say it was designed by Pratt & Whitney, a division of United Aircraft Company?

That it takes complete cooperation among the designer, Air Force, and manufacturer to make engines as rugged and performance-demanding.

That the J57 is used in some of the latest Air Force equipment: "venetian series" fighter aircraft.

It is an international heavy bomber and KC-135 tanker transport.

That it takes a vast network of parts suppliers working into 27 states to feed in the components we need to meet our schedule.

That it takes teamwork as every kind of installation and maintain quality volume production.

You can see real statistics don't tell the full story. Unintentionally they miss this vital point. Behind every completed engine lies a tremendous amount of cooperation and skill.

We believe the J57 jet engine is good we've developed a high degree of faith.



AIRCRAFT ENGINE DIVISION • FORD MOTOR COMPANY  
7401 SOUTH CICERO AVENUE • CHICAGO 29, ILLINOIS

## Mountain Strips Limit Twin Pioneer

By David A. Anderson

Grass-Switzer's three-month ordeal on the Scottish Aviation Twin Pioneer has shown it to be a versatile performer with exceptional short field performance and no drawbacks. Limited single engine performance at mountain airports.

That being so, it is expected to dominate the Twin Pioneer as a possible addition to the Switzer fleet, although the all-out decision has not yet been made. Switzer Industries are now studying the results of the trial operation.

On one engine, the Twin Pioneer can maintain a ceiling of about 7,000 feet, enough for some civil and military trials. But here where mountain strips are cleared even planes 5,000 or 6,000 feet above sea level, the reserve of power and altitude is too marginal for most normal operations.

To increase that margin, Switzer has had the load capacity of the aircraft to 11 or 13 passengers instead of the design capacity of 10.

In every other aspect, Switzer pilots regard the Twin Pioneer as a most reassuring aircraft about the STOL performance of the ruggedly simple.

### Three-Month Trial

The Scottish aircraft completed a three-month trial under charter to Switzer on March 31. Most published portions of the trial was the ski lift to mountain resorts of the Zermatt area. During the trial period, only one such lift had weather—which shut down all operations at the end of September. Left the Twin Pioneer on the ground. Its maintenance and operations gave no major or minor troubles, and the airplane was always available for its flexible and regular flight schedule.

Utilization for a day's operations including the ski lift trips was about seven and one half hours during time. Toward the end of March, early morning of the snow on the mountain around the field at Zermatt into a mudhole and operations into that area stopped.

During the trial period, a typical flight day started at 0600. The plane flew down to Grass (115 miles) and then made a round trip to La Chaux-de-Fonds, one of the outstanding centers about 5,000 feet elevation as the last mountains (117 miles round trip). It left Grass to fly to Zermatt and back with skiers (200 miles round trip) and then made a second run to La Chaux-de-Fonds and back. In the evening it returned to Grass. The day's total 722 miles.

These are all short hops, short and



SWISSAIR Twin Pioneer loads passengers at La Chaux-de-Fonds, elevation 1,800 ft.



TWIN PIONEER makes its northern scheduled profit for mountain trips.



"Skiing Special" Twin Pioneer loads passengers on Swissair line at St. Moritz.

tion's long time, our mountaineers learn that demands routine living and precision approaches through the passes and down the slopes. The famed and fabled Twin Pioneer has the ability to stay on a slope and let down a high rate of descent with a low forward speed. The long-stroke landing gear is ideal for the rough fields and mountain steps. Crossing speed of about 100 to 175 knots indicated is adequate for the short distances.

#### Manning Help

I rode the Twin Pioneer on the short training lay from Geneva to La Chaux-de-Fonds, about forty minutes away

by air. T-4000 was routine and continued to pattern so there was no chance to see the third-hold performance. T-4000 ran on concrete was about 13 seconds, and the plane had about 500 feet under it at the end of the 7,500-foot runway. The impression of the Twin Pioneer in the air is a good one. It has a solid feel and the main turbulence of the mountain ridge is quickly damped out in the slight swing of the plane. Nose level compares to the Douglas DC-3, and there is the usual advantage of propwash on the landing slot and high frequency vibration in the tail fin structure. Knowledgeable as I am—

perhaps Scottish, adequate is the best description.

Climbing speed was approximately 165 knots indicated. The Alpi Leonardo propellers were turning at 2,400 rpm. Approach to the landing strip at La Chaux-de-Fonds was flat and routine, there are none of the funnel-shaped mountain faces to fly down as in the case at Zermatt.

On the return trip, the takeoff was not such nice second and the Pioneer which had been held with brakes while the engines were run up to full power, seemed to leap into the air.

#### Pilot's Discretion

The steep hill to Geneva, in common with other routes flown by the Twin in its trial, was left to the discretion of the pilot. Then the VFR on these services and can pick the route they find is best. Then, later the country they fly over probably better than any other group of airline pilots around, because in their quiet hour, none of their fly schedules over these same mountains, looking for woods and avoiding severe turbulence.

We flew parallel to the ridge of the Jura range while the pilot varied back toward Geneva to flying through passes down into the next.

Landing and ground service at Geneva was to justice.

Swissair's interest in the Twin Pioneer is probably a major one, geared to that portion of the Swiss economy that lives on tourist trade. Like most European carriers, Swissair is in competition with its own country with high-speed, frequent and comfortable jet services. The two jets of Swissair land—about the size of Rhéol Island, Connecticut and Vermont—mean that there has been little interest in service. The cost of building airports and facilities for landside connections is small, but in small towns is prohibitive, and there are too much time to be saved again.

But at the moment, service the way is difficult. Swissair would like to be able to sell tickets to cities from New York to a spot like St. Moritz. The aircraft needed for such a service would add a capacity near that of a DC-3 and the ability to operate in and out of mountainous fields. Yet big enough to fuel two jets. The Twin Pioneer looked like the ideal candidate for the job, but the trial period has shown otherwise.

#### Two Possibilities

Swissair has suggested two possibilities to Scottish Aviation for meeting Swiss contribution requirements. First, the Alpi piston engines could be replaced by two Turbomeca turboprops to give more power for the same or lower installed weight. Second, a small turboprop engine could be mounted in

## BACK THE ATTACK ON TRAFFIC ACCIDENTS

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DAIMLER-BENZ



CURTIS-WRIGHT



Studebaker-Packard

These three companies employ 397,000 people, with sales in 1956 totaling one billion, two hundred sixty-five million dollars, assurance the signing of agreements providing for a fully integrated program of engineering, production, sales and service of automotive vehicles, automotive, marine and industrial gasoline and diesel engines, and diesel and gasoline fuel injection systems. All of these companies have been awarded for years with quality, precision manufacture and high-performance products.

Pursuant to these agreements, Daimler-Benz and Curtiss-Wright have formed an American company—Curtis-Wright and Mercedes-Benz, Inc.—to provide for the development and sale of Daimler-Benz products in the United States, Canada, Mexico and Cuba.

Studebaker-Packard Corporation in signing the agreements will now make available to its dealers a full line of domestic and imported sports cars, convertibles, sedans and station wagons—ranging in price from under \$2,900 up to \$11,000—gasoline and diesel powered trucks and all wheel drive utility vehicles.

Mercedes-Benz cars and distinctive Mercedes-Benz features—such as fash coachwork, swing seats and transmission—will be exclusive to Studebaker-Packard.

The Uten-Bend Division of Curtiss-Wright Corporation, now building diesel engines for the U. S. Navy, will export and manufacture Mercedes-Benz diesel engines and diesel and gasoline engine fuel injection systems under the agreements. The engines will range from a 4-cylinder model of 25 h.p. to a supercharged 6-cylinder model of 600 h.p.

Further agreements are being negotiated between Daimler-Benz and Curtiss-Wright Corporation for the interchanges of rights for the manufacture of aircraft products.

Carl F. Jones  
Carl F. Jones  
President, Daimler-Benz  
of North America, Inc.

W. T. Hinkle  
W. T. Hinkle  
Chairman and President,  
Curtis-Wright Corporation

H. R. Churchill  
H. R. Churchill  
President, Studebaker-Packard  
Corporation

the feel of the plane and cut in during takeoffs and landings to provide the subtle nuances of power should one engine cut out during these critical moments.

Efficient development would take considerable time to construct and get into production. Maurice Swirec has

a problem that has yet to be solved. How, to transport a portable portion of the layout made from all major water national aspects at Geneva and Zurich to the member states that account for, next to watchmaking, the biggest portion of this country's economy.



SOUND-ABSORBING gratings of new Conquest test chamber are removed by pneumatic equipment. Edward Bremer (left) and Frank Delbert. Work flow and cooling of the acoustic chamber are based on glass fiber shaped into patterned wedges. Floor grating is removed during tests of materials.

## Sound Chamber Built for 880

See Diego-Corral in building a new 557,000 cubic foot space to test aircraft and engines scheduled for use in its Conquest 880 jet transport. Object is to determine what materials will provide quietest possible passenger compartment.

Two of the base lab work are completed. Construction of a third will start soon. In one is a reinforcement (sound absorbing room) and as machine (tech test) chamber.

Electronic noise prediction, acoustical and loudspeakers project the actual volume and frequency of sound reverberating jet engine exhaust noise and the aircraft will be in place near the aircraft's external skin at high speeds.

Modular concrete with block, by the sound waves in the mechanism room. In the machine chamber all various surfaces—walls, floor and ceiling—are lined thickly with glass fiber shaped



In 1933, Grunth Daimler built the world's first high revolution engine engine.

In 1934, Karl Benz obtained the world's first patent for a motor vehicle.

In 1935, these two pioneering manufacturers joined in a merger to form the present Daimler-Benz A. G., Stuttgart, West Germany.

Today, Daimler-Benz builds the world's finest automobiles—the Mercedes-Benz—and produces diesel powered trucks and tractors and diesel engines from 20 to 2000 horsepower for marine, and land industrial uses.

The company exports from Germany to 120 foreign countries through more than 1,500 agencies and distributors and operates assembly and production facilities in 27 foreign countries.

Daimler-Benz today employs 22,000 in Germany and an additional 12,000 outside Germany.

Sales in 1956 were \$285,000,000.



In 1910, Grunth and Walter Wright flew for the first time on history with an airplane and engine of their own design. Glenn H. Curtiss pioneered in aircraft development during the same period.

In 1919, the Curtiss-Wright Corporation was formed by merging the companies founded by the Wright Brothers and Curtiss. Today, Curtiss-Wright is a leading producer of aircraft engines, machine tools, precision flight simulators, and other aircraft equipment for the military and the commercial aviation, as well as products in the fields of chemical, electrical, electronics, thermodynamics, physics and aerodynamics. The latter activities in aviation today are produced by Curtiss-Wright engine, a Curtiss-Wright engine, engine, the Bell 201 to world speed and altitude records.

Curtiss-Wright employs 15,000 in 17 divisions and subsidiaries in the United States and two foreign countries and operates plants throughout the world.

Sales in 1956 were \$675,000,000.



Beginning in wagon manufacturing in 1921, the 22-cylinder Bertha produced a 14 horsepower gasoline per cent car in 1924 at South Bend, Indiana.

In 1924, the Packard Motor Company produced a 35 horsepower car at Warren, Ohio.

In 1934, Studebaker-Packard Corporation was formed through a combination of these two companies. Today, Studebaker-Packard Corporation manufactures a complete line of passenger cars, trucks and station wagons which are distributed throughout the world and sold by more than 3,000 dealers in the United States and Canada. The company pioneered modern supercharged engines, low silhouettes jet styling, two-tone color schemes, torque steering and Simco, six-cylinder engines.

The company's products are assembled in plants operating in 11 foreign countries.

Studebaker-Packard Corporation employs 5,000 at South Bend, Indiana.

Sales in 1956 were \$323,000,000.



## READABILITY

### Pioneer-Central Gives You Integral Lighting

Panel instruments that can be read at a glance—now offered by Pioneer-Central Air Speed, Rate of Climb, Turn and Slip and a variety of other instruments, including the Machmeter shown above, now available with Integral Lighting. All units comply with Lighting Specification MIL-L-25457A.

Numerical instruments are always contrasted, reading white on dark and red on light—the color scheme has proved best suited for sharp readability with minimum effort on "dark-adapted" eyes.

Lighting is even and shadowless, with a uniformity of 5 to 1.5 foot lamberts. There is no "jagging" of graduations and numerals. A minimum of floor lamp-life bulb is in each instrument assures up dependability, almost no "trim" technique. Light is directed out at the dial. Arranged for a demonstration: PIONEER-CENTRAL DIVISION OF BENTLEY AVIATION CORPORATION, BAKENFORD, MASS.

West Coast Office: 1510 E. Normandie Boulevard, Suite 100, Los Angeles 44, California. Telephone: 375-1. Also in: New York 17, N. Y. (Representative: Aviation Electronics, Inc. 200 Corporation Blvd., Norwood, N.J.)



**FOUR-WHEEL** high landing gear for Cessna 441 jet transport is worked up at Cessna San Diego plant. Cockpit installation and wiring is complete and an outfitting and lighting will be completed this month.

into wedges by heavy wire mesh and mounted on the wall surfaces in a regular pattern. The glass fiber wedges top and absorb any sound transmitted through a fast reaction into the machine, chamber. The fiber itself attenuates high frequencies, the wedge shape absorbs low frequencies.

The material samples are mounted in a glass box between the two rooms. In the laboratory's third unit, a full scale 20-ft. metal section of the ASB will be tested as a whole to measure the absorption of interior loss, with frequency, moisture, dust, radiation and other components in relation to other noise levels.

The new laboratory was designed in consultation with Bolt, Berneck & Newman, Inc. of Cambridge, Mass.

### GE to Build Hangars At Edwards for USAF

Cincinnati-General Electric Co. has started construction of four flight test hangars at Edwards Air Force Base, Calif., under a \$A 517,000 contract contract with the Air Force.

Structures will be used by aircraft engine contractors for flight test, minor design modifications and maintenance work. GE is conducting advanced tests at Edwards on the F73 which powers the Convair 440B fighter bomber.

Other three hangars will be assigned to Pratt & Whitney, Curtiss-Wright and Allison. Completion is scheduled for early 1955. Hangars will be built by Mulach Construction Co., Glendale, Calif.

## REPORT FROM RYAN

# New Engineering Opportunities Created as Ryan Projects Mushroom



**FRANK W. RYAN** vice president and chief engineer supervises architect's drawing of new Engineering and Research Center.

### New Engineering and Research Center To Meet Ryan's Expansion

Construction of a modern two-story, engineering and laboratory building has begun at Ryan, to meet the company's expanding work in jet VTOL—Automatic Navigator—jet Drones—Missile Guidance—jet Motorbikes—Balloons.

The new facility will provide additional quarters for many of the 1000 employees in Ryan's fast-growing engineering division.



**RYAN ENGINEER** "visual" aircraft up in company motorbike cockpit.

example, new chemical, metallography, materials, environmental and safety test equipment.

With one in ten Ryan employees in engineering, the division has tripled in three years. Its mushrooming growth reflects Ryan's increased importance as a research facility in aerodynamics, propulsion and electronics.

### Vertical Flight Probed with New VTOL Cockpit

Shorter way into the sky is straight up—in the Ryan Vertigo. To probe this new realm of flight without becoming airborne at a risk preferred daily by Ryan engineers. Their secret? A motorbike cockpit connected with electronic computers.

Ryan's flight simulator laboratory is a prime tool in the use of new aircraft designs. Both the Vertigo and the subsonic, turbo-propeller Vertigo are put through their paces via controlled flight test. Ryan leadership in this new technology new concept of flight is based upon 246, various members of VTOL, research and development. It is another example of how Ryan builds better

### Ryan Automatic Navigator Guides Global Flight

An advanced system of aerial navigation, designed for high speed, long range flight, has been developed by Ryan electronics engineers, working under sponsorship of the Navy's Bureau of Aeronautics.

Designated AN/APN-67, the new navigator at the highest, near computer, self-contained electronic navigation in production. Developed to meet military needs, it will also meet commercial jet flight requirements.

The system provides precise and accurate with continuous information on long range, ground speed, ground mileage, drift angle and ground speed. It is accurate and unobscured. Requires no operator, ground facilities or wind data.



**AUTOMATIC NAVIGATOR** guides global with computerized system.

### Ryan has immediate career openings for engineers

Look to the future. Join Ryan, where you can grow with an expanding, varied field. Long-term growth and a variety of challenging career opportunities in all three elements of modern flight vehicles: aerodynamics, systems, and ground-based electronic equipment. It's your choice.

Send resume to Ryan's personnel, Engineering Department, 1001 E. 10th Street, Suite 100, Los Angeles 44, California. Enclose your resume and a recent photograph. We'll contact you.

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**Pioneer-Central Division**  
BAKENFORD, MASS.







Here's Why General Electric's New

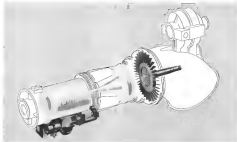
# BEST POWERPLANT

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**T58'S ADVANCED CONTROLS, FREE TURBINE DESIGN** help simplify pilot duty, allow the

helicopter rotor to operate at best speeds for climb, cruise, or hover conditions.



**T58'S MAIN REDUCTION GEAR** permits convenient take-off or power extraction.



**T58'S 3-POSITION EXHAUST NOZZLE** mounts vertically or at 90-degree angles.

## Offers unmatched performance capability; advanced mechanical design features

**Over 3-1 Power-to-weight Ratio**—Pushing more power per pound than any other gas turbine engine of comparable output, the T58 delivers 1034 horsepower yet weighs only 535 pounds (including 35 lb reduction gear). What will the T58's low weight mean to future helicopters? Devise reductions in their gross weight—up to 40% faster cruising speeds—greater endurance—and vastly increased payload capacity. In addition, the T58's advanced aerodynamic and lightweight mechanical design promises the same high reliability that has been proven in G.E.'s J47, J73, and supercruise J79 jet engines.

**0.69 Specific Fuel Consumption (normal, with gear)**—The T58's turbine inlet temperatures, pressure ratios and the aerodynamic design of its major components have been balanced to provide the highest possible operating efficiency over a wide range of helicopter flight conditions. Result: a proven SFC that rivals the piston engine for economical operation.

**Automatic Rotor Speed Control**—The T58's revolutionary new constant speed control eliminates the need for speed adjustments by the pilot during normal flight operation. Combined with the T58's free power turbine, this new control automatically regulates engine output to meet changes in load or flight attitude, thus permitting the helicopter rotor to operate at the most efficient speeds for take-off, climb, cruise and hover.

**Small Envelope Size**—Measuring only 59 inches long by 16 inches at maximum diameter, the T58 enables possible more compact engine compartment design, additional cargo space.

**Variable Exhaust & Power Take-off Arrangement**—The engine's 3-position exhaust and fore or aft power take-off arrangement also simplifies problems of designing or retrofitting engine compartments in either single- or multi-engine helicopters.

The T58 was developed for the Navy by General Electric's Small Aircraft Engine Dept. General Electric believes the T58's many features make it the best engine of its kind to transform the role and performance of helicopters into new levels of military and commercial usefulness. For detailed performance data, call your local G-E Aviation & Defense Industries Sales Office, or write: General Electric Co., Section 123-3, Schenectady 5, New York, for T58 brochure.

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## AVIONICS

### Smaller Companies Combine to Compete

By Philip J. Klein

Medium size avionics companies, too small to win prime contracts for many of the complex weapon systems but too big to be content with subcontracting, are joining forces to compete with the industry's larger firms.

These alliances, which could reshape present business-management patterns, may thus be the forerunners of a new corporation to perform systems engineering for its entire firm in a lower subdivision of firms that pool their talents for a joint weapon system proposal.

These moves could lead eventually to the formation of large new avionics companies through corporate mergers, but that is not the present objective.

The two companies in the forefront of this new movement are: • **Hoffman Electronics Corp.**, Concord, N. H., which has been quickly reaching out into other medium-size avionics and non-avionics firms to join in setting up a new company for the specific purpose of ensuring systems management functions for its participating members and submitting joint proposals on complex weapon system requirements. Hoffman told *Aviation Week* that he hopes to have the new organization set up by the end of the year. • **Ferguson Radio and Photograph Company's** Government Electronics Division, Emerson, has worked up a loose federation of roughly a dozen other medium-size firms, some avionics, others in fields like rocket propulsion, and has established corporate and technical liaison between these associates, as they are called. When a new military or aerospace contract comes up, management and technical committees are formed for the project with a representative from each of the associates whose skills are required. In making up a proposal, the committee decides which company will function as prime contractor and the company then submits the joint system proposal in its own name.

It is interesting to note that the trend toward more complex weapon systems may counter to the industry's long-standing philosophy of decentralization. Avionics divisions in a large company frequently face such the same problems as medium-size avionics firms in engineering their technical forces for a complex weapon system program.

This was one of the factors behind Bendix Avionics' recent move to set up

a corporate Systems Division at Ann Arbor. Much Radio Corporation, an Avionics recently set up a similar division and Sperry Gyroscope Co. has restructured its operations to recognize all the broad-based complex weapon system programs.

General Electric, which has a number of subelectronics departments, each with annual gross sales of \$10 to \$100 million, is seriously considering the formation of a systems management operation. A GE official says he expects that the company has lost position as one supplier of the avionics business as a direct result of the fact that individual portions of the systems are assigned to separate departments.

#### Caught in the Middle

The firms that have been caught in the middle by the trend to large complex weapon systems usually are those whose annual sales range between \$20 and \$50 million and which employ between 100 and 500 engineers.

Such firms usually are specialists in one or two fields, such as flight control, fire control, navigation or communications.

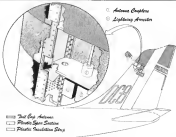
Many have grown to their present

size as a result of competence in these fields. The quantity and quality of the medium size company's engineering staff may equal or exceed that of the big firm in the former's field of specialization.

#### Valuable Source

Paul B. Wickett, president of Minneapolis-Hallmark, whose Avionics Division probably falls in the medium-size category, says: "How still strong these firms are, many of the best of these firms have come from one more to a few men employed by the result, highly specialized company rather than from the large corps of engineers and research scientists maintained by the so-called industrial giant."

"The small company which understands and concentrates on its own field," Wickett says, "frequently finds itself ahead in the development of that product line than does the large company whose pioneering effort is likely to be diluted in the whole program of the company's varied interests. Finally, the most productive original ideas are likely to reach the top quickly in a small operation, to get a full hearing, an adequate trial and a recom-



#### Antenna for DC-8

Douglas has selected an antenna for high frequency communications use on the new DC-8 jetliner. Douglas says the antenna, used on its military job, was selected after analysis of other type HF an-

tennas, including the probe type which Douglas reportedly will use on its T-47 jet. Protection from lightning strikes will be provided by antenna which forms part of electronic antenna complex.

ful application to a problem that looms large in the work company."

Even a complex like General Electric probably would not take issue with these basic philosophies since they are one of the strong considerations behind GE's own decentralization program which generally has proven to be best first in some of the company's lines of business.

#### Difficult To Manage

"The complexity and advanced technology nature of modern weapons system developments require a much technical and management depth that the military has been forced to seek

outside assistance. Usually this responsibility has been delegated to a single line in the aircraft, systems or microwave field, or to a special organization specifically assembled for the purpose. For example:

- Prime contractors, such as General for the B-5, and American Telephone & Telegraph Co. for the DEW Line.
- Special facility, such as the Massachusetts Institute of Technology's Lincoln Laboratory, which is developing the SAGE air defense system.
- Management contract, such as the USAF's interconnected halfway house program at The Rand Woodbridge Corp.

It appears unlikely that the military will find more competent answers. Its role as a Rand-Woodbridge type management contract. For one thing, the profit ratios to the services on its high priced latest is very low. Secondly, the terms of the contract at RAND prohibit it from supplying any of the equipment itself, in order to insure that its management judgment will be unbiased. This excludes the company from participating in a major program which could be a source of profitable production. Finally, if the service personnel who manage such a program away from their laboratories and from engineers for too long, there is danger of their losing some of their technical competence.

#### Fused Type

The explosion of the prime contractor type of weapons system management has given us a popular. Most of these contracts have given to large companies that have all or most of the needed skills under one corporate roof and which are large enough to assume financial responsibility for a major program.

However, Les Hoffman believes that the selection of large companies frequently results in "heavy reliance of command decisions, the accident who does the work, and the top management that makes the decisions and this has a tendency to inactivate creativity."

Hoffman and Kinsman believe that there is an alternative which can open up new sources for weapons system management, yet one can missing knowledge, facilities and management. Hoffman proposes to get down to work

## One Minute X-ray Inspection at Grumman Aircraft



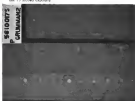
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Where a new unitary requirement appeared on the horizon, the relevant independent corporation would work out a program using its own skills plus those of the engineering organizations of its franchisees. The proposal would be submitted by the new system management committee.

Hoffman says that programs would be sub contracted to participating companies according to their skills and aptitudes. However, he recognizes that the national management corporation must be free to select the best available sources for one job, even if that means hiring from a company outside the locale.

Control air data computer, to be used on Republic F-105 and McDonnell F-108, provides single integrated source of altitude, speed, temperature signals for aircraft flight control, fire control, bombing navigation, engine control, communications and air conditioning systems. Device was developed and will be produced by Eldec-Powers Division of Bendix Aviation under a \$7.1-million contract.

Emerson is using a different approach to the same problem. It has formed a loose federation of about a dozen mad-drummer companies, both avowed and unavowed. Emerson first studied his own in-house capabilities, then went out to hire up associates with technical skills in areas where Emerson had a void—for example, in oilseed, surface and rocket propulsion areas.

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connections are formed successfully. In one case where this was done, when the definitive requirement was stated the project committee decided that the stress of one of the associates on the committee would not be required. The associate was asked to sign out which it did "graciously," according to an RCA spokesman.

One interesting aspect of the Fairchild plan is that the associate selected as the prime contractor will not take a profit on the subcontract to its associate. This is of deep concern with most people. Even with a large firm it is customary for the department serving as prime contractor to take a small profit mark up on the subcontract to other departments within the company, which also take a profit mark up.

Engineers and its associates already have submitted one major proposal under the new legislation and currently are working on another.

### Boards Operation

The operation of Radio America's new Systems Division began some months ago to both Holloman and Edwards airbases. The Systems Division serves as the company's focal point for weapon system programs which require the skills of several of the more than 20 separate boards divisions. It performs the original system analysis required for the proposal and the subsequent Phase I studies, making use of available talent available in its sister divisions.

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tions and accept the peace contract in behalf of Britain's Avonites.

The Systems Division then operates in an advisory capacity only, providing assistance to the Leader Division if required, according to Dr. Russell D. O'Neil, general manager of the Systems Division. This new operation now has approximately 40 scientists and experts to have 100 on duty payroll by the end of the year, according to Dr. O'Neil.

### Not The Only Way

The nations which Emerson, Hoffmann and these associates have in working into major weapon systems programs will determine whether this pattern of operations will spread. However, there appear to be several alternatives for the intermediate company.

Dr. Claude Baerens, director of General Mills Mechanical Division, believes that a midsize firm can obtain prime contracts for major weapon systems if it is willing to go about its efforts.

A year ago, at the Dayton Aeronautical Electronics Conference, Baerens named the piglet of the midsize company "with expert research talent and facilities but not of a depth sufficient to handle a major complete weapons system." Such companies, Baerens warned, were being caught in the middle by weapon systems prime contractors who were expanding their own facilities to meet with new sub-system fields instead of using the existing capabilities of midsize-size firms.

In the intervening year, General Mills has successfully completed with bigger firms and won two contracts for "major weapon systems," Baerens says, although he declines to be more specific on security grounds. Baerens attributes this success to the fact that General Mills went ahead to build a computer systems engineering team capable of coming up with proposals which the military found more attractive than those of the larger companies.

### Woe in Competition

Sorden Associates, a small but fast-growing services company, won a major sub-system contract in competition with Westinghouse Electric and Bell Telephone Laboratories on the basis of the simplicity of its Phase I studies.

Another interesting trend is what might be termed parasitism of opportunity, when one division of an industry goes into business with one or more midsize companies for a specific program in preference to working with its sister divisions. Sometimes such parasitism of opportunity brings together two firms which are competitors in another area or on another program. In the words of one industry official, "It's a copy, copied by busi-



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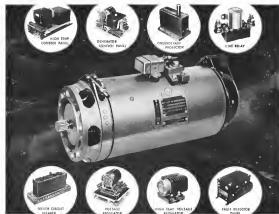
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2002	100	100-2000	40.0	45	30-100
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2004	300	100-2000	120.0	75	30-100
2005	400	100-2000	160.0	90	30-100
2006	500	100-2000	200.0	105	30-100
2007	600	100-2000	240.0	120	30-100
2008	800	100-2000	320.0	150	30-100
2009	1000	100-2000	400.0	180	30-100
2010	1200	100-2000	480.0	210	30-100
2011	1500	100-2000	600.0	250	30-100
2012	2000	100-2000	800.0	320	30-100
2013	3000	100-2000	1200.0	450	30-100
2014	4000	100-2000	1600.0	580	30-100
2015	5000	100-2000	2000.0	700	30-100
2016	6000	100-2000	2400.0	820	30-100
2017	8000	100-2000	3200.0	1050	30-100
2018	10000	100-2000	4000.0	1280	30-100
2019	12000	100-2000	4800.0	1510	30-100
2020	15000	100-2000	6000.0	1840	30-100
2021	20000	100-2000	8000.0	2450	30-100
2022	30000	100-2000	12000.0	3680	30-100
2023	40000	100-2000	16000.0	4910	30-100
2024	50000	100-2000	20000.0	6140	30-100
2025	60000	100-2000	24000.0	7370	30-100
2026	80000	100-2000	32000.0	9760	30-100
2027	100000	100-2000	40000.0	12150	30-100
2028	120000	100-2000	48000.0	14540	30-100
2029	150000	100-2000	60000.0	18400	30-100
2030	200000	100-2000	80000.0	24560	30-100
2031	300000	100-2000	120000.0	36820	30-100
2032	400000	100-2000	160000.0	49080	30-100
2033	500000	100-2000	200000.0	61340	30-100
2034	600000	100-2000	240000.0	73600	30-100
2035	800000	100-2000	320000.0	97520	30-100
2036	1000000	100-2000	400000.0	121440	30-100
2037	1200000	100-2000	480000.0	145360	30-100
2038	1500000	100-2000	600000.0	183920	30-100
2039	2000000	100-2000	800000.0	245480	30-100
2040	3000000	100-2000	1200000.0	368040	30-100
2041	4000000	100-2000	1600000.0	490600	30-100
2042	5000000	100-2000	2000000.0	613160	30-100
2043	6000000	100-2000	2400000.0	735720	30-100
2044	8000000	100-2000	3200000.0	974280	30-100
2045	10000000	100-2000	4000000.0	1212840	30-100
2046	12000000	100-2000	4800000.0	1452000	30-100
2047	15000000	100-2000	6000000.0	1837600	30-100
2048	20000000	100-2000	8000000.0	2453200	30-100
2049	30000000	100-2000	12000000.0	3678800	30-100
2050	40000000	100-2000	16000000.0	4904400	30-100
2051	50000000	100-2000	20000000.0	6130000	30-100
2052	60000000	100-2000	24000000.0	7355600	30-100
2053	80000000	100-2000	32000000.0	9741200	30-100
2054	100000000	100-2000	40000000.0	12126800	30-100
2055	120000000	100-2000	48000000.0	14518400	30-100
2056	150000000	100-2000	60000000.0	18374000	30-100
2057	200000000	100-2000	80000000.0	24530000	30-100
2058	300000000	100-2000	120000000.0	36786000	30-100
2059	400000000	100-2000	160000000.0	49042000	30-100
2060	500000000	100-2000	200000000.0	61298000	30-100
2061	600000000	100-2000	240000000.0	73554000	30-100
2062	800000000	100-2000	320000000.0	97410000	30-100
2063	1000000000	100-2000	400000000.0	121266000	30-100
2064	1200000000	100-2000	480000000.0	145182000	30-100
2065	1500000000	100-2000	600000000.0	183738000	30-100
2066	2000000000	100-2000	800000000.0	245298000	30-100
2067	3000000000	100-2000	1200000000.0	367858000	30-100
2068	4000000000	100-2000	1600000000.0	490418000	30-100
2069	5000000000	100-2000	2000000000.0	612978000	30-100
2070	6000000000	100-2000	2400000000.0	735538000	30-100
2071	8000000000	100-2000	3200000000.0	974098000	30-100
2072	10000000000	100-2000	4000000000.0	1212658000	30-100
2073	12000000000	100-2000	4800000000.0	1451818000	30-100
2074	15000000000	100-2000	6000000000.0	1837378000	30-100
2075	20000000000	100-2000	8000000000.0	2452978000	30-100
2076	30000000000	100-2000	12000000000.0	3678578000	30-100
2077	40000000000	100-2000	16000000000.0	4904178000	30-100
2078	50000000000	100-2000	20000000000.0	6129778000	30-100
2079	60000000000	100-2000	24000000000.0	7355378000	30-100
2080	80000000000	100-2000	32000000000.0	9740978000	30-100
2081	100000000000	100-2000	40000000000.0	12126578000	30-100
2082	120000000000	100-2000	48000000000.0	14518178000	30-100
2083	150000000000	100-2000	60000000000.0	18373778000	30-100
2084	200000000000	100-2000	80000000000.0	24529778000	30-100
2085	300000000000	100-2000	120000000000.0	36785778000	30-100
2086	400000000000	100-2000	160000000000.0	49041778000	30-100
2087	500000000000	100-2000	200000000000.0	61297778000	30-100
2088	600000000000	100-2000	240000000000.0	73553778000	30-100
2089	800000000000	100-2000	320000000000.0	97409778000	30-100
2090	1000000000000	100-2000	400000000000.0	121265778000	30-100
2091	1200000000000	100-2000	480000000000.0	145181778000	30-100
2092	1500000000000	100-2000	600000000000.0	183737778000	30-100
2093	2000000000000	100-2000	800000000000.0	245297778000	30-100
2094	3000000000000	100-2000	1200000000000.0	367857778000	30-100
2095	4000000000000	100-2000	1600000000000.0	490417778000	30-100
2096	5000000000000	100-2000	2000000000000.0	612977778000	30-100
2097	6000000000000	100-2000	2400000000000.0	735537778000	30-100
2098	8000000000000	100-2000	3200000000000.0	974097778000	30-100
2099	10000000000000	100-2000	4000000000000.0	1212657778000	30-100
2100	12000000000000	100-2000	4800000000000.0	1451817778000	30-100

\* These ratings are for generators. Motors are available in standard 1000 W.

Red Bank Division of

you? Here are a few examples:  
 • **American Bosch Arms Corp.** teamed up with GE's Light Military Electronics Equipment Department (LMEED), which supplied the radar for Army's B-12 tail defense system, in won out over a competing B-12 defense system proposed by GE's Aircraft Products Dept.

• **General Electric's LMEED** teamed to a small subunit company, Dynatrol, to provide the gyroscopes for its new Doppler rate-navigation system despite the fact that two other departments within GE are active in this field.

• **The Ramo-Wooldridge Corp.** is developing an airborne digital computer for Westinghouse Air Arm Division as one program, but joined General Electric's LMEED in a partnership with Douglas Aircraft Co. to submit a proposal for an airborne early warning system.

Meanwhile, R-W will build radar for Army's DC System Division which is second source for the Army B-12 tail defense system, while GE's LMEED supplies the radar to Army.

In the fast-moving weapons field, the only safe conclusion is that today's customer may be tomorrow's competitor and perhaps your partner the day after.



### Technique Reduces Closed TV Costs

New technique which should reduce the cost of closed-circuit TV installations over distances of 10 to 15 miles by permitting use of narrow-band telephone lines instead of expensive video cables not supported generally by C.R. Kruse of the Bell Telephone Co. of Pennsylvania.

The narrow-band technique requires a bandwidth of only 250 kc, a 160 reduction over the 4,000 kc normally required.

Yet it permits transmission of moving subject material and motion.

The system does not result in serious loss of definition in pictures (See photo.) Compared to the 725 line picture sent 30 times per second in conventional TV, the new technique provides a 125-line picture 10 times per



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**gives positive motor protection to  
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Globe Industries of Dayton, Ohio, produces thousands of small, precision-made electric motors every month for a variety of small equipment applications. And, an integral part of many of these motors is the dependable KLIXON Protector, which is built in to assure maximum motor output under adverse operating conditions, with positive protection against burnout.

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RCA offers an opportunity for you to apply your technical skill to its Missile Test Project at Patrick Air Force Base, Florida—"Launching Site of the Satellite."

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**RADIO CORPORATION OF AMERICA**

second or a 185 line picture 15 lines per second.

Reggie telephone lines are used but special equipment is required to correct phase and distortion distortion and to terminate amplifiers may be required in some cases.

General Precision Laboratory and Data Television Division of Thompson Products, Inc., both makers of industrial TV equipment, cooperated with Bell Telephone in the development.

### FILTER CENTER

**Artic Flare CS88 Tests—Annapolis.** Radio line soon will modify one of its New York station HP transmitters to evaluate the Kuhn compatible single sideband (CS88) technique to determine whether it can be used with existing equipment. Artic spokesman strongly denies published report that it has or intends to adapt CS88 and shrouds apparent carrier single sideband at this time.

**Soviet Relay Network Analysis—San Jose.** aspect they have designed machine which will automatically analyze relay network design to determine whether it can perform without logical contradictions. Machine was described in paper by Dr. Michael A. Gornov of the Moscow Academy of Sciences at recent symposium on switching theory at Harvard University. Machine described in Gornov's paper reportedly is more fully automatic and can handle more variables than any U.S. device now in existence. Russian's paper also revealed that Kuznessov scientists published more papers on switching theory than any other country except for U.S. and U.S.S.R.

**Transistor Declared—Tucson.** and magnetic amplifiers, which have almost completely replaced vacuum tubes in new digital computers, may eventually be replaced by new electromagnetic film devices which can perform switching operations in one-thousandth of a second. This prediction was made by Dr. Herbert Gold at the recent Harvard University symposium on switching theory.

**CAA Buys Collins Microwave—Civil Aeronautics Administration** has placed \$3.1 million order with Collins Radio Co. for 12 microwave link installations which will be used to route radar information from new CAA long-range radar stations to traffic control centers. The Collins equipment will operate at 7,600 mc. One link, between Houston, Tex., and traffic control center at San Antonio, will cover 200 miles and require six relay towers.

**Transistor Sales Up—Tucson.** rate figures will nearly three times as many units in the first two months of 1959 as they did in the same period last year. This year's sales reached 3.2 million units, compared with 1.2 million for January-February 1958, sales in dollars were \$8.3 million versus \$3.6 million in 1958.

**New Tube Handbook—General Electric** has issued new edition of its tube handbook, called "Essential Characteristic" which lists data on 1,155 types of tubes, including new military types. Handbook, priced at 75 cents, has plastic ring binding.

**Navigation Meeting—Annapolis.** Institute of Navigation meeting will be held June 22-23 in Washington D. C. at the Sheraton Park Hotel. President of Assistant Edward P. Coffin will be the principal speaker at June 23 dinner.

**Super-Sixty-Raytheon** is now using new automatic X-ray detector in pulse television tubes for radar. New Machine can photograph up to 18,000 tubes per day.

**Radio Abroad—Baltimore—Northern** Airlines has added Radio Radio weather radio, VHF communication and navigation equipment, selective

**G-E  
600-watt  
Landing Lamp  
has...**

## 3 ADDED FEATURES AT NO ADDED COST!

**LONGER SERVICE LIFE—G-E's** new cold-coil filament is rigid, needs no support wires to prevent sagging. This means there is no sewing action between support wires and the filament, eliminating this cause of premature lamp failure.

**CONSTANT BEAM AIM—G-E's** Landing Lamp No. 4550 uses a new method of "anchoring" each filament end to a lead-in wire. This calls for precision spot welding of two metal strips, insuring rigid support between the filament and the lead-in wire.

**IMPROVED BEAM PATTERN—The** precision design and location of the filament guarantee a circular beam pattern of more even intensity. Earlier types had "egg-shaped" beam pattern that were less uniform.

For more information on General Electric Landing Lamps, or any of the other General Electric Aircraft Lamps, call your G-E Lamp Distributor, or write: General Electric Co., Mission Lamp Dept., AW-37, Nela Park, Cleveland 12, Ohio.

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## Systems engineering—38th parallel style

Here's the challenge we received from the Korean Civil Assistance Command and the U. S. Army Signal Corps:

Build a telephone communication system to their specifications that will function over mountainous terrain. Cost as little as possible. Maintain... up to 24 hours a day... equipment compatible with the experience and background of the population.

The answer is the system now being installed in South Korea.

Merely equipped telephones, control offices and PBX switchboards, varied to civilian population unfamiliar with dual methods.

Wide lines for basic country-wide linkage, augmented with many c/o north of Carver, where numerous traffic warrens it. And—delivery on schedule.



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### Sardine Can

Unmanned USAP beacon transmitter has output of 25 watts and operates for 20 hours from power supply. Unit is now scheduled in service use, measuring only 7 1/2 x 4 1/2 x 6 in., weighs 8 oz. Antenna, located in hermetically sealed tube, is placed into transmitting position by small gas pressure change. Beacon was developed and produced by Electronics Division of Fairchild Controls Corp.

collar, automatic direction finders and powerline address supplies for navigation on its five new harboring Britain coast.

► **New Business**—Following company report receipt of major new contracts:

• **Sasacoma Gyroscopic Co.**, Santa Monica, Calif., has received \$1 million contract from Douglas Aircraft Corp. for vertical gyro indicator systems.

• **General Electric's Technical Products Dept.**, Syracuse, N. Y., has received Army Signal Corps contract of undated task for a closed-circuit color TV system to be installed at the USAP Missile Test Center, Cape Canaveral, Fla.

• **Boeing Corp.**, Detroit, has been awarded a \$1.5 million contract for data processing and transmitting equipment for the SACG air defense system by the Air National Command. This order total of more than \$13 million in SACG equipment awarded to Boeing.

• **General Electric's Aircraft Products Dept.**, Johnson City, N. Y., will build \$1.3 million in fighter bomber for radar equipment under a new Air National Command contract.

• **General Electric's Light Military Electronic Equipment Dept.**, Utica, N. Y., has received \$12 million Air Force contract for advanced electronic countermeasures equipment, radarproofing and microwave to earlier \$12 million contract from the Air National Command.

## Aerodynamicist

The Electronics Division of Curtiss-Wright Corporation has an excellent opening in New Jersey for an aerodynamicist to analyze flight performance characteristics of all types of aircraft, using theoretical design and flight test data. The results of these data are used as a basis for design of large scale analog systems as used in flight simulation. B.S. or M.S. in Ae. E. and 1-5 years' experience in performance analysis and stability and control with airborne manufacturer.

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R. G. Crand

Vice Engineering Department, Dept. EE-2  
Curtiss-Wright Corporation, Wood-Ridge, N.J.



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## Expansions, Changes In Avionics Industry

Stromberg-Carlson, Inc., has established new Vermont Film Products Division in St. Georges, Calif., which will develop and manufacture components using vacuum film deposition technology. New division will be headed by David W. Moore.

Other recently announced expansions and changes in the avionics industry include:

• **General Instrument Corp.** has purchased Radio Receiver Co., Berkeley, maker of avionics and electronic equipment. The purchase is General Instrument's third acquisition in the past year.

• **U.S. Industries, Inc.**, New York, will acquire the outstanding stock of Kett Corp., Greenboro, which makes related communications and other electronic devices. Karl Schmitt, president and founder of Kett, will continue to head the new acquisition.

• **General Electric's Avionics and Outboard Systems Dept.** has completed \$11 million Air Force facility for assembly and testing of precision solid avionics step a milestone in the Berkeley, near Hancock, Mass.

• **American Electronics, Inc.**, Los Angeles, has formed new division to be known as Avionics Laboratories which will provide complete environmental test facilities and services for contracting to major government and component manufacturers. Avionics Laboratories will be housed in a new 11,000 sq. ft. facility at Fullerton, Calif.

• **General Avionics Corp.**, consulting and development firm specializing in electronics and applied mathematics, has moved into new quarters at One Bala Ave., Bala Cynwyd, Penna.

• **Computing Devices of Canada, Ltd.**, will handle Canada Radio's avionics line in Canada following new agreement transferring sales responsibility from Avionics Electronic Ltd., which will continue to handle products of other Bendix divisions, including Eclipse Trainer.

• **Consolidated Electronics Corp.** has leases granted for two 37,500 sq. ft. office and laboratory buildings in Monrovia, Calif. to house its Transducer and Systems Division. Completion is expected by October.

• **Sennrich Concepts Co.**, Santa Monica, Calif., has leases granted for new 514 million, 181,000 sq. ft. plant and general offices at Sherman and 20th St. in Santa Monica, New facility

will cost company total to over 200,000 sq. ft.

• **Consolidated Electronics Corp.**, Pasadena, will purchase assets of its neighbor, William Miller Instruments, Inc., which will be associated as the Miller division. Miller's two subsidiaries, Transducer Engineering and Pacific Transducer are not included in the deal. Edwin M. Graham, former Miller executive vice president, is named general manager.

• **Baldwin-Luna-Houston's Electronics and Instrumentation division** has formed new Dynamics Products group at Wilshire, Minn., to design and develop equipment for measuring shock, vibration and accelerations. New group will be headed by Alexander J. Yarnash, chief engineer and a U. J. Kerley, assistant chief engineer.

• **Pulse Instrument Division of Heath Avionics** will add 66,000 sq. ft. to its present 100,000 sq. ft. Baltimore facility. Occupancy is slated for December.

• **North American Avionics's Avionics design** has opened an eastern office in Washington, D. C., in the Citicorp Building. New office is headed by Norman F. Blum, formerly a member of the Avionics Laboratory at Wright Air Development Center.

• **Consolidated Electronics Industries Corp.**, New York, has received solid-state approval which could lead to



#### Airport Seeing Eye

Church-Rose TV camera, designed for use day or night for runway surveillance, is protected from climatic, low motor-driven windshield wipers. Unit is part of new line of closed-circuit TV equipment developed by Fisher Corp. TV camera can be fixed, tilted, panned and their operation openings adjusted for remote control.



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## *Traveloader* handles crated airplane wings with ONE man with ONE machine

The labor, time and money-saving role played by industrial trucks throughout industry has long been recognized. But until now, there were no available methods or equipment for satisfactorily applying them to extremely long, bulky or awkward loads. Now comes the Baker Traveloader, designed for just this purpose. It is ideal for jobs like the one illustrated—where it is handling airplane wing sections created for export.

The Traveloader is essentially a fork truck that

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central organization of the Screen Clock Co., Fairfield, Conn. CIBC will provide loans and management assistance to Screenex through a subsidiary and obtain option to buy interests in all of Screen's assets at any time up to June 30, 1962.

• **Sensomechanics, Inc.**, Westbury, N. Y., has broken ground for new 15,000 sq. ft. facility due in Westbury in West July 51, for design and more latest of money control equipment.

• **Acoustic Lines** will set up sales representative in the Pacific Northwest for **Drummers Research Associates**, Piquette, Mo., a division of **Universal Mach. Corp.**, and maker of magnetic amplifiers.

• **Galtes Industries, Inc.**, Metuchen, N. J., has formed **Nuclear Instruments** from Division in Albany, N. Y., to operate in nuclear instrumentation and instrumentation Division is headed by **Earl J. Batten**, formerly of the **Sandu Corp.**

• **Chubb Manufacturing Co.**, Skokie, Ill., maker of turbines and other equipment has opened New York office at 134 Madison Bldg., Philadelphia Park, N. J. Office is headed by **Edward A. Rube**.



## ICBM Data Facility

New data reduction center at the **Ramo Wooldridge Corp.**, Los Angeles, will be used to speed processing of intercepted test data for its **Guided Missile Research**.

• **Tektronix, Inc.**, Portland, Ore., maker of precision oscilloscopes, has opened new field engineering office in New York area at 540 White St., Albion, N. Y.

• **Universal Transistor Products Corp.**, a unit near of the former **Universal Abrasive Corp.**, Wuxham, N. Y., Company's electronic and microwave instrumentation operation becomes its **Universal Abrasive Division**.

Division which has various engineering or quantities for the **Avco** defense cable program. Facility was designed by **R.W. Electronic Instrumentation Division**.

• **J.B. Res Co.**, Santa Monica, Calif., has expanded its computing services facilities with an additional \$100,000 in equipment, including a new **Electronic Associates** analog computer.

• **Hobson Laboratories, Inc.**, Los Angeles will increase size of its new 18,613 sq. ft. facility by 10% of its original plans, to provide an additional 20,000 sq. ft. Facility is slated for completion in July.



Sealed test tank after handling



Tank, loaded by CEE-BEE method, after testing



CEE-BEE method and results, tank

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vides three ranges: 0-10, 0-100 and  
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sensitive circuits with accuracy of 0.1%  
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lower scales. 2 megohms on upper scale.  
Unit operates from 115 ± 5% cps,  
weighs 5 lb. Price \$470. Paul Indus-  
tries, P. O. Box 3474, Glendale, Calif.

•Infrared radiation source, Model  
CPD 3, provides stable, accurate, con-  
trolled black body radiation over broad  
range of temperatures from ambient  
plus 10C to 500C. Unit measures  
7 1/2 x 9 x 18 in. Heflin, Beaumont &  
Brown, Inc., State College, Pa.

•Low-frequency wireless generator,  
Type LP-51, can generate sine waves of  
frequencies of 0.001 to 500 cps with  
accuracy of within 2%, pulse where  
duration can be varied from 1 millise-  
cond to 1/800 seconds, with rise time  
less than 5 microseconds. Ramp func-  
tion can be generated with 1% line-  
arity over range of 1 millisecond to 10  
seconds. Output can be continuously  
varied between 100 microvolts and 140  
volts. Belsco Industries Corp., 88 Stone  
Road, Port Washington, N. Y.

•GMR voltmeter, Type PT-30V  
for exhibiting signal presence and  
measuring magnetic voltage levels, has  
sensitivity of 5 mV and a scale from  
1 to 2,000 mV when used with re-  
sistive insertion unit. Voltage range is  
1 mV to 30 volts. Federal Telephone &  
Radio Co., 900 Kipling Rd., Elkhart,  
N. J.

•Sweep oscillator, Model DV-2206,  
covers frequency range of 5 to 5,000  
cps, in one continuous band, eliminat-  
ing switching intervals and dual  
discontinuity. Dial is directly cali-  
brated in true log scale. Amplitude of  
signal output is variable in 10 steps.  
Dynaac, Inc., 395 Page Mill Road, Palo  
Alto, Calif.

•High-power broadband sweep oscil-  
lator, Model 12SC, covers band of 1 to  
15 Mc, provides power output of  
30 mw to 1 watt using seven inter-  
changeable microwave modules.  
Federal Electronics Corp., 4570 34th  
St., Long Island City 1, N. Y.

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for accumulation digital computers and  
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for d.c. operation in the 0 to 100 Mc  
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ers and buffers, master amplifiers,  
one-shot multi-shooters, variable fre-  
quency blocking oscillators and crystal  
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are mounted on 2 1/2 x 3 1/2 in. open glass  
printed circuit card. Computer Control  
Co., Inc., Wellesley 37, Mass.



•Transistor-com logical element, con-  
sisting of one transistor and one re-  
sistor, functions long magnetic core,  
exists in two different modes, one used  
for operating at 0 to 50,000 bits per  
second, the other 0 to 100,000 bits per  
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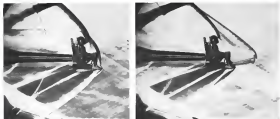
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## EQUIPMENT



**PROTECTION** from slip-flow gusts is demonstrated by wind-tunnel tests. Test DFB is unpowered, the other (right) has drive.

## Crash Program Seeks Ejector for High

By George L. Christian

Deer Creek program to remedy a design deficiency—subsonic escape system in supersonic aircraft—is beginning to pay off for Air Force and Navy.

In subsonic supersonic aircraft, escape has come up with two new seat configuration concepts: each different from the other.

• **Slip-flow gusts**—supersonic air flow, directed downward on a basis in front of the pilot. This concept is tied with Lockheed's downward ejection D-seat.

• **Rebated or breast-guarded** system which rebates the pilot 90 deg. before separating from the plane so that he slides into the air stream in a flat forward position with the seat bottom posturing him.

### Third System

A third escape system, called the A-seat, also is being developed. This seat combines the Lockheed type of slip-flow gusts with a nonextensible upward ejection seat.

Dual purpose of the new supersonic escape systems is to avoid fatal deceleration and tumbling experienced at supersonic escape speeds with nonextensible ejection seats.

Goal is to keep the crew member's personal equipment from being ripped off by air blast.

All three configurations have true supersonic capabilities. The Lockheed D-seat is rigidly taking shape at Starlin-

gton Corporation's new plant here. Scale models of the other two seats are undergoing comprehensive tests.

The D-seats are expected to be available for production F-104s before the end of the year and can be installed into F-104s now flying. Of these seats already built, two have been tested from supersonic speeds at Edwards AFB (AVF Feb. 23 p. 567) with excellent results.

Half-scale models of both B- and A-seats will soon be tested at the same facility.

Starlin has also completed a pole-type cockpit escape capsule. It was built and will be tested under a contract from USAF's Wright Air Development Center.

The problem seats represent the first pieces of hardware resulting from an air-

craft-side program to develop escape systems with true supersonic capabilities. Contract was assigned by USAF's Air Research and Development Command the responsibility of coordinating development of an upward pilot escape system. Lockheed was assigned a parallel responsibility for development of a downward escape system.

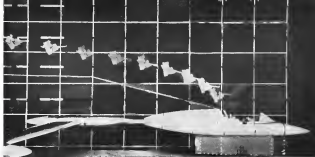
Contracts resulted from the military's realization of the new seat developments of the escape systems used in the growing number of supersonic aircraft now operating. The existing seats' limitations are approximately 600 in. and 90,000 ft., well below speed and altitude capabilities of some types of Air Force and Navy aircraft now being in operation.

Discussions facing the services seven months ago was whether a substantial



**MODELS** of B seat depict its three phases of operation. First is normal position.

**EJECTION** begins with raising of leg shields, and seat whips "fold up" pilot.



**TIME-LAPSE** photos of ejection of Lockheed seat type from model show its stability after leaving aircraft.

## Mach Escape

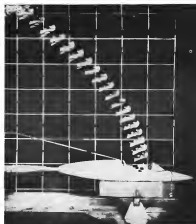
improvement could be made over the existing subsonic-seat at best time-on-seat, and how much effort to trace and answer the project might require.

### Crash Program

USAF last October decided to set up a crash program to help the problem fast. To implement the idea, the Air Force formed the Industry Core Escape Systems Committee, composed of eight major airplane manufacturers. At tender the KC-135C meetings, asked about quantity or otherwise, are 17 other organizations. They include other airplane makers, test and support agencies, manufacturers, a research group and Navy's BuAer. Chairman of KC-135C steering between Lockheed and General. A group of five USAF technical specialists and engineers, called the Air



**LEAVING** the aircraft, seat has rotated 90 deg. and rebalancing the force subside.



**8-HEAT** ejection photographed by time-lapse method also shows seat stability. Exiting quickly of two supersonics corrects air path variation, not seat quakes themselves.



lance. Coordinating Committee sets in an all ICESG functions to evaluate its work.

The coordinating committee consists John Truchsess, Air Research & Development Command and Peter de Salvo, Air Material Command, co-chairmen, and three members from WADC: Lt Col K. F. Thompson, Aero Medical Laboratory; Maj. A. C. Muraw, Crew Station Office; and A. B. Nutt, Aircraft Laboratory.

So far, there has been no problem of the ICESG making progress. "Technicians told American Wars. "The system are certainly getting their money's

worth. There are no "proprietorship" in the group. Technicians find, and something is available to everybody. ICESG is achieving substantial results in "an unbelievably short time," he added.

Wright Field officials note these highlights of specimen development in ICESG's work and related test programs:

- Future upward ejection seats (the Lockheed J-10) may be the first and last production downward seat) must have zero altitude capability. The new subaltitude or control ejection seat (AW No. 12, p. 71), is expected



**FULL SCALE** Ejector cockpit is shown with a man seated in it. In escape seat, straps hold up, swing pilot's torso toward his chest. Seat rotates 90 deg. and fires ejection.



## Aeroquip Engineering Notes



R. A. SMITH, JR.

The advertisement at the right says you can save money if you buy Aeroquip. How then, let's see how right this statement is.

Consider the product line along which an aircraft engine or airframe is assembled. Your purchasing department will buy components from those to its master supply of hose lines to feed the propulsion line. In this day and age of rapid change, it is pretty much a foregone conclusion that some engineering revision or modification will be required on the engine or airframe.

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If you purchase hose lines with permanently attached hose fittings, no removal is possible and you must pay at least double for the privilege of making an engineering change. If you purchase Aeroquip Teflon Hose Lines you see, in the cut away, save money—often more than half of what new hose lines would cost you. And, you can buy the Aeroquip hose line with its Detachable, Reusable "super gem" Hose Fittings or prime cost fittings with the price you pay for Teflon hose lines with permanently attached hose fittings.

*R. A. Smith, Jr.*  
Vice President and Engineering  
Aeroquip Corporation



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Cutaway of "super gem" fitting with inside seal and seal protected by ball and lip seal at right. Together, these fit into a third cut around protection against leakage.

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**Model DDL**

Magnetically damped low-range instrument available in ranges from  $\pm 1$  G to  $\pm 500$  G. Ultra-sensitive models supplied as low as  $\pm 0.1$  G. Certified to MIL-S-8880 and MIL-C-8831A. Especially good in shock and vibration applications. As zero-drift, non-sensitive rugged version of the DDL, is designated as the Model DDS.



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**Model GMD**

Assembly Model GMD with internal thermostat-operated heater, allowing maximum environmental stability within the instrument. Damping resistance constant with change in ambient temperature.



**Model GDM**

Miniature double-potentiometer instrument capable of sensing broad maximum environmental stability within the instrument. Damping resistance constant with change in ambient temperature.



**CATAPULT** used to develop Dusat tool 1/10 inch models into a battery unit.

to be of great help in meeting this requirement. It shows crew members high enough into the air to make sure they escape trouble. The rocket tube, concept was developed by The Fulton Design Corporation, Riverside, N. J., and Ebro Engineering Co., Inc., Houston, Texas.

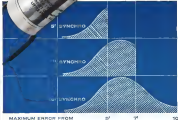
Work will soon start, either at Lockheed or North American, on a "Cousin" type test which ejects crew members upwards. Good it to avoid complication of the B-57, which enters the pilot's seat backwards 90 deg. during the ejection cycle. Lockheed's dog-fight simulator has a component of this simulated Dusat, now being integrated with the A-7, to protect the pilot from air blast. If such a seat can be successfully developed, it will have the added advantage of being much easier to enter for refueling operations, aircraft than the more complicated, earlier B-57.

Lockheed's Dusat has been successfully ejected from high speed shock at Mach 1.2 at sea level equivalent to Mach 2 at 35,000 ft. According to sources, "it was a good, stable little firing machine." Dynamic pressure on the seat was as acceptable 7.500 psi.

High speed sled tests with anthropomorphic dummies show that standard VC-4 jetted pressure suits are inadequate for aggressive bailout. However, results have been experienced with the standard MA-1 Air Force helmet. Spaceman in B-57, such as the helmet off emergency bailout. Space and design is predicted on use of a helmet: the Air Force has time to make a sudden swing over to the new MA-1 helmet of the AN-17 proves conclusively to be unsatisfactory.

Effort now is principally to keep pilot alive during ejection sequence. In ejection, he will be subjected to forces which none were close to his physical tolerance limits. He can expect to be brought around and breathe. However, seat design will keep him from sustaining such intolerable injuries as severe strains or broken bones. He will be

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Manufacturers are busy broadening their research and development activities. They recognize that their competitive position depends on the ability to compete in the urgent quest for new basic scientific knowledge in such diverse fields as aerodynamics, aerothermodynamics, metallurgy, human factors and aerothermochemistry, etc. Because of the highly specialized sciences and technical fields concerned, manufacturers must often obtain research and development assistance from outside sources — government, university, scientific foundation, foreign and other manufacturers. In a sense, research and development has become a unique commodity that is produced, bought and sold.

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Industry's vital and rapidly increasing role in research and development will be surveyed.

Indexed guidebook section tells industry what

facilities and capabilities are available, where they are and how to utilize them. Information on the marketing of research and development availabilities will be reported.

Newly revised government research and development contracting policies and procedures explained in detail.

#### **GOVERNMENT**

Missions, organizations and operating procedures of National Advisory Committee for Aeronautics; Air Research and Development Command; and Office of Naval Research summarized. Their laboratories, research stations and test center facilities, capabilities and availabilities analyzed in detail.

#### **UNIVERSITIES AND SCIENTIFIC FOUNDATIONS**

Extensive report on the important research and development programs at work at various universities and independent establishments throughout the country. Particular attention is given to the procedures of sub-contracting these resources.

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## 4000 feet straight down—with a ton of steel

Not a disaster—just one of about 200 regular flights made by E. M. "Bert" Westcott in the bottom of the Grand Canyon. Taking off from Kingman, Arizona, where he operates the Kingman Flying Service, he's ferried steel girders, motors, cables, supplies and construction crews to a tiny steel strip 4000 feet below the canyon rim.

"They're building a trestle to haul gravel to the top of the rim, and I've had to fly in everything this week," says Mr. Westcott. "My old Traveler is just the ticket for this kind of heavy hauling—as long as I have Chevron

Aviation Gas in the tank. Even on landing, hot days in 75°F, 450 puts out full power on Chevron with never a misfire. Chevron never fails, plays, either—I know I'll get out where I'm going, and get me back.

"Of course, I take care of my engine. I overhaul it 1000 hours for safety's sake, but I always feel RPM Aviation Oil has kept the engine near perfect right up to the time down. 'RPM' holds engine compression at factory standards. Keeps parts clean and free—I never have trouble with sticking rings or pre-ignition."

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D-58AT with slip-flow governor has rings on head left. Subhanging line on extended. Slip flow governor protects pilot from excessive air blast.

oil to shift for break after landing.

Later on, we hope to develop the state of the art to the point where a low number will feel like flying 15 miles of golf or landing—but that is still in the future. As a spokesman, Wright Field spokesman commented:

•Open escape routes on the secondary circuitry of ICESC. It is not necessary to shut down the engine.

•High reliability is the factor dominating all efforts of ICESC to develop escape routes. As a spokesman said, we will not compromise with reliability in complexity of the system. Reliability increases with the system complexity.

•We will only accept escape routes with the highest order of reliability. While the British Martin Baker seat is very good, its standard of reliability was not acceptable to the USAF, he added.

### Personal Equipment

Establishing the escape route system is an exception of an even personal equipment to determine whether it will stand up under high speed ejection. The entire system is so simple into complexity that personal equipment in one existing gear should give satisfaction, it is the case of the MAJ helmet. Gear of all these aspects is to get suitable equipment with being in the aircraft, possible time—this is the program.

Lockheed will work along with D-58AT development when ICESC was established. "This D-58AT was conceived and developed by us with direct design contribution from Douglas Aircraft," Lockheed said.

Covers, while generally associated with the development of the D-58AT, has credited that accomplishment to ICESC.

Slusky will translate the design of

both seats into operating hardware. The D-58AT can provide safe escape at speeds exceeding 500 ft. at sea level and Mach 1 above 50,000 ft., according to both Lockheed and AEDC. Its altitude capability reaches at least 60,000 ft. possibly as high as 75,000 ft. The D-58AT's design of the seat indicates that it is the French design.

The D-58AT, while not as far along in evaluation and testing as the D-58AT, will have approximately the same speed and altitude limits as the D-58AT—about 600 ft./50,000 ft. of recent escape routes.

### Recent Break Through

Although, of the speed and altitude breakthrough that new seat system can be judged by the fact that in the five years standard escape seats have been in use, safe escape speeds have increased less than 100 ft. In the past seven months, addition of over 100 ft. plus a large altitude increase has been achieved.

Although the new seat will enable pilots to achieve that altitude safely at speeds well into the supersonic, they are not an obvious solution.

Personal matter to improve survival must be the result, according to Slusky's engineers. An F-4's recent ejection has made ejection a standard feature in fighter aircraft designs. Only was a man can survive abandonment of aircraft at speeds of Mach 4 and velocities of 100,000 ft./100 ft. is to be considered. North American's X-15 is designed for such speeds.

With this capability in their sights, Slusky technicians are working on a small number of first stage ejection seats already are in production and are scheduled for test in about six months.

Slusky is not entering its life as

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### TIP OF THE MONTH

Bright colored jackets and shorts sometimes cause reflections in the windshield, can cut night visibility. It's smart to wear dark clothes on night flights.

...for hot performance...LONGER

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For a sealing problem of any kind—call on LINEAR or one of its agents for engineering assistance...

and be sure to Specify LINEAR "O" Rings for every application.



ing efforts to combat stress. Richard H. Frost, Stanley vice president, told Aviation Week that he is writing on a project called hypoxia/panic. Clearly, along the test pilots' JCA would automatically, need not pilots whose planes had plunged beyond controllable limits.

#### Industry Attitude

Attitude of the aerospace manufacturer generally has been that the eight percent response to, spontaneous escape cannot be justified by the small percentage of accidents which would have to be made at response speeds.

A single bail-out made to North American test pilot George Smith from a disabled F-100 Super Sabre at 777 mph (AVR Nov. 14, 1955, p. 34), a line he was said to be a succession of maneuvers, did cause to galvanize the air frame industry into action that any other single event.

Plane crashes had their attention irresistibly drawn to the fact that spontaneous escape was a real problem, again then today and not tomorrow, and that a lot of it was of both test and service pilots were going to be sacrificed on a necessary unless something was done about developing a true spontaneous escape system for their fast-moving planes.

C. L. (Kelly) Johnson, now Lockheed's vice president, engineering and research, then chief engineer, led a company team effort in the design and development of the radical, showing F-104, for which the Dornier was designed. Major role in Dornier development is credited to Irving Corbin, a veteran LMC engineer. He headed a group which produced the final test configuration in which the drag, penetration and its related lines.

#### Crashout and Her

For both to develop this was, 20th Century life was, Corbin claimed such modern apparatus as spontaneous escape parachute occupied two months time, he needed into the past for an improved even box and a better seat. He used the case how to launch a side models of some different configurations of the seat. The better seat was used to catch the cockpit at the end of their 180 ft trajectory. Scale speeds of up to 1,000 ft/sec were needed. The wooden fire flight test models were subjected to gust demands, similar performance to full scale tests.

Use of the modern machine in place of a modern wind tunnel should avoid results of research and development from the tests, needed to come up with the final test configuration. Wind tunnel data and mathematical analyses were then used to adjust scale flights to simulate full scale flight accurately with the Mach number range. Results

were also correlated with a similar model test data. Two major advantages of the Lockheed Dornier.

•Lowest drag of any system and new design. It shows from 500 to 500 ft in two seconds, requiring an initial deceleration force of 10G in the pilot's seat within the limits of human tolerance.

•High light stability over a wide range of speeds, to keep the pilot's body from becoming a vertical ovaloid similar to his torso, as a Stanley spokesman put it. Also, stability permits total hydrostatic heat being built up in the pilot's blood stream as a result of rapid taxiing.

Low drag feature of the seat results from the stream of heat protecting in front of the pilot on a beam. Load is used to get a much weight as possible in a small space out in front of the pilot for correct control of gravity. Shape is supported by lifting force from the bottom to two in, at the top, height is eight in.

The generator modifies the air flow pattern to cause flow separation around the pilot and his equipment. These effects of the device are:

•Reduces seat drag by producing the effect of a third body. Derivative forces in the pilot are lowered by one

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parachute is opened as soon as the seat drops the nozzle.

Special design features on the seat include:

- **Back flare:** of seat elements are, instead of the seat to "tip off" as it shoots out of the glass. Top of the seat is free to rotate, feet back, head down. It is caused by the air blast hitting the bottom of the seat first as it emerges.

- **Roll:** An extension panel, located behind the seat, must operate at low speed. Operation has to be positive, otherwise seat will roll and require loads at the day flow generator. Special engineers designed the fin extension so the fin can extend to give over control and then, immediately with speed. To stop the extension process, which is subject of high speed, energy is absorbed by extending an extension belt over a member. The overboard arrangement assures that the fin will deploy correctly at low speed while passing a method of slowing the very high energy loads imposed by high speed ejection.

## Downward Ejection

There are many advantages to a downward ejection seat. There is also one big disadvantage—pilot cannot eject from zero altitude. Current ejection altitude is 500 ft.

Low altitude is no problem if speed is high and the pilot has control of his plane, since he can either roll it over and eject upward or mean it to the safe ejection altitude of 500 ft. or more. If, at speed and altitude are both low, he is trapped.

- **Altitude:** Five Starliner Aviators' test personnel, rules and service, cited the advantages of ejection downward.

- **Lower ejection velocity:** because there is no vertical fall to clear. Also, gravity will require lift of the seat legs, so that about 100 ft. in the maximum speed on a crew member ejection downward. Upward ejection requires about 300 ft. or more—due to the 200 lb. test for known ejection of positive vertical G loads above that limit speed factors begin to occur. A related upward ejection problem is the relatively short distance—just a few feet—that the seat has to travel to attain maximum velocity. Thus many ejection accidents on the pilot ejection the 200 G's. A human can tolerate in the positive vertical ejection.

- **Lighter structure:** for the entire ejection system is possible because of the lower G requirements.

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# LEAR



### Test Stand for Titan

Test stand under construction by Martin Co. in Astoria, Ore., will be used for static testing of Titan ICBM. Starts in building mobile for USAF.

able. Seat can be dropped out of the way and mechanism can stand in the cockpit in week.

### F-104 Too Fast

Lockheed went to a downed system seat for its F-104 because the plane is so fast that a pilot could not tolerate the system blast that would be required to shoot him over the plane's vertical tail if he windmilled at such high speeds.

However, the F-104 was designed before the recent development of rocketable seats.

This development was again a strong link to all-around seating seats to take advantage of their zero altitude potential.

An Air Research and Development Command spokesman told Aviation Week that the Air Force is currently considering installing the F-104 in an open tail position.

The F-104 differs considerably from any known seat configuration. Basic concept is to rotate the seat 90 deg during initial system tests in that, as seat escapes from the cockpit, the pilot assumes a feet-forward and head-up position. In this manner, his head will be exposed to the jacket risk during the instant he moves out of the protection afforded by the windfield—much as, during a steep climb, the pilot is exposed to the seat's tail rotor. Studies done not only the aircraft's exposure will be exposed, ARDC engineers are not so sure. During separation, horizontal and vertical line drops along sides of seat to give it stability.

What plane separation does not occur will not be completely rotated.

A downward and rearward swing rocket can be incorporated to give the same increased separation and reduced deceleration characteristics in the 1,000 feet.

Seal models of both B and A seats have been extremely wind tunnel tested. Both seat configurations are still subject to refinement and change in wind blast and position test program.

ICFSC has recommended that both seat configurations be developed through the test phase. Only after both seats have been so tested and evaluated will the ICFSC attempt to determine which seat will be recommended for standard application to all Century Series fighters. Present one configuration may be better suited to some planes and the other to the remainder of the Century Series.

Final evaluation and review of the Air Force aerospace escape system development program is scheduled for this fall.

### Escape Capsule

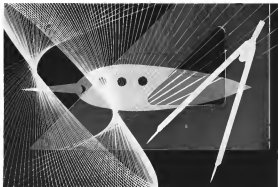
First consideration in thinking on aerospace escape and survival is the man.

The engineering problems involved in escape from high performance aircraft are insurmountable, but a number of solutions are in sight. Application of weapon system thinking—the consideration of all the factors involved in aircraft escape—should result in a better safety record despite the increased stress on aircraft performance.

Heavy emphasis is needed on two fundamental problems: making the decision to escape, and training personnel in use and maintenance of the escape system.

Need for a safe escape system for high performance is underscored by the aircraft's prospect of perfect reliability of all the accessories of its personnel. High-100% power booster motors, electronic view displays, auto-aim, engine controls and related complex devices without which high Mach number flight is impossible.

Since D seats and similar devices make



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Arthur Carl Ingman, President of Autonetics, in 1964 after receiving his D.E. from the University of California at Berkeley. Dr. Ingman has been responsible recently for his work in nuclear research and was also recently named as a NATO researcher in Italy.



Jack W. Hines, Autonetics Project Engineer in Electrical Engineering at the University of California at Berkeley. He has been in the field since he joined the company in 1951. Now Group Leader in Computers and Instrumentation, he has been working with the staff of Autonetics in the development of various instruments. Includes photographical record book in file.

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their limitations in the speed and altitude regions of about Mach 3 and 75,000 ft., and aircraft aircraft will soon exceed both of these limits, a new escape system must be found. Capsules appear to be the answer.

Problems of designing a capsule which will have deceleration and stability characteristics within the tolerance envelope of a human being are similar to those faced in designing a suitable aerospace system now. These are difficult, however. Deceleration is not so much of a problem because of the capsule's inherently high mass and streamlined shape. Actually, Soder's first capsule will deploy a small drogue parachute 1 second after separation from the plane to slow it down. The chute will also provide yaw and pitch stability.

Turning and spinning will be avoided by extending stabilizing fins.

A problem inherent in automatic capsule design, which does not plague rockets, is how to include roll stabilization to tell the capsule which way is up. This will probably require a sophisticated roll computerized gyro plus power to operate the gyro and the controls to right the capsule.

Examples of when roll stabilization will be needed are:

- Separation at high speed and low altitude. The detached capsule's attitude control can be used to orient it to a safe attitude for parachute deployment of the capsule known which way is up.
- Separation when the plane is in an inverted attitude. A stabilization system will be needed to right the capsule so that it will come into the sky instead of into the ground.

Capsule should include:

- Positive lift through its aerodynamic configuration. This will help it "float" to dissipate kinetic energy and come to rest safely at altitude.
- Weak links attaching it to the aircraft to allow it to break loose and slide off the aircraft in case of a sudden emergency.
- Duct integrity and ballasting to allow it to find right side up.
- Survival equipment to keep the occupant alive until rescued.

First, a former engineering test pilot for Bell Aircraft and a member of the Caterpillar Club, stressed this enormous advantage of a capsule over an ejection seat: the pilot can shed most of his weight and leg-locks in an instant should a loose capsule, he can step down to a Coast helmet and oxygen mask. First and personal equipment for high altitude flight is becoming so complicated and expensive that it is impossible the pilot's efficiency in piloting complicated, expensive aircraft.

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complaint of excessive weight should apply to capsules. Although a capsule does weigh about 175 lb, once this is taken into account, the capsule helps to reduce the weight of the airplane because heavy structure, needed to carry stresses around the leg hole that is the cockpit, can be eliminated. The reduction in airframe weight approximately cancels out the weight penalty of the capsule, according to Pratt.

There is no problem in moving the control and instrumentation behind the capsule in the plane. Small fuel, water, push pull rods or cables can be fed with extruded actuated lines while large lines, such as air conditioning ducts, can include a slip joint which connect with CAD-actuated valves to close them off quickly before the capsule is separated.

## RATO Separator

Capsules probably will include a RATO separator to provide lift for the capsule, especially at very low altitude.

Pratt believes that an Ingersoll Rand Altair should be developed as an air test pilot who then would get into recoverable situations or when this has consequences for a potentially fatal length of time. The fastest test pilot that all too often, test pilots die with their capsules damaged but the gear when recovery is a luxury being impossible and thereby sacrifice themselves unnecessarily.

Pratt believes ICA should be used as a solution basis. A pilot could turn the system on just before striking a dangerous situation or just before being shot down between being the system goes into a visual or auto alarm when the danger point not reached, or he might use it to anticipate ejection in case he becomes incapacitated.

## Survival Computer

The system could use inputs available in already existing equipment—such as air speed, altitude, attitude, ground proximity, and G loading. All data would be fed into a computer which would continuously compare this data with the aircraft's structural and mission range limits.

When the limits were exceeded, or alerts became too low to remove, the pilot would be alerted.

## Weather Bureau Orders New Radiosonde Tracker

Spice Corporation of America will develop an instrument for radiosonde tracking a radiosonde transmitter of 50 watts for 100 mi. Instruments to be built under \$1,250,000 contract from Weather Bureau, will consist of portable antenna, receiver, control console, housing and accessories for automatic tracking.

# BUSINESS FLYING



OH MARK model 490 14-passenger executive transport will be powered by two Allison 581D turboprop engines.

## On Mark Takes First Turboprop Order

First order has been placed for a U.S. corporation for On Mark Engineering Co.'s new Model 490 twin turboprop-powered 14-passenger executive transport, revealed recently at Van Nuys, Calif. (AW Apr. 22, p. 148).

Marling Aircraft Corp., Colorado Springs, Colo., will take delivery of the first production On Mark Model 490 next in 1970. Initial prototype is expected to start its flight test program next summer. Current production planning is to produce two Model 490s monthly. Additional corporation orders for the Model 490 are being negotiated.

On Mark executives are aiming the production rate for 60 months, turning out 120 airplanes. Company President Robert D. Denny told Aviation Week that he foresees selling 100 airplanes without difficulty in response for executive use. On Mark will also make the airplane available to the military services all the while in a VIP transport and even, toward to replace current obsolete piston engine transport.

## Price: About \$1 Million

Price schedule on the Model 490 has not yet been settled. According to Denny, prospective buyers can figure on paying approximately \$1 million for the airplane, with interior and option equipment included, but not including software equipment. Price includes installation of the equipment.

On Mark is working on a new line plan in making the Allison 581D gas turbine engine, instead of reducing the engine's initial price. Since powerplant and propeller installation comprise a major cost

item, it is trying to attract Affiliates in leasing these to Model 490 purchasers on a per hour basis. If this doesn't work out, On Mark probably will use the powerplant package, and handle the lease program itself.

## Price Reduction

Advantage of such an approach would be to bring the retail price of the airplane down to approximately \$660,000. Classified estimates on the cost of an Allison 581D installation is about \$110,000 per aircraft, including propeller.

Denny told Aviation Week that he has already placed an order for two Allison engines and Aeromarine propellers. He added that the General Motors Division has been negotiating with the Model 490 project.

On Mark plans to build the Model 490 to meet Civil Aeronautics Administration Part 94B Transport Category requirements. It is currently building a full-scale mockup, expected to be completed in about 60 days. It will also build a full-scale actual fuselage for structural tests in a water tank. Water tank test program will run the 10,000



Model 490, based on the Douglas B-26 design, will cost about \$1 million. Allison will mount at 620-630 mph depending on load and altitude. Mockup is under way.

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needed crane lifts, often will be purchased at 1,000 ft. mean sea level, when at 70,000 ft. the vehicle will be submerged in an equivalent of sea level. Dual engine propulsion system will be installed without engine drive for loss. In event of an engine failure at 70,000 ft., the vehicle will maintain an equivalent of 12,000 ft. in the air.

On May 1, currently studying a full-scale sales and production program to build cooperation around its new project.

Now being prepared is a detailed brochure, plans also include building a 40-in. model that can be dismantled for testing. Model would be capable of being dismantled to show the student's primary features, including passenger cabin layout.

Model 150 engine dates back approximately 24 years, when the Gs Model engineers started studies of a new general aviation design for the 8-16 piston engine conversion. About a year and a half ago, when it appeared that conventional turboprop engines would become available earlier than he had expected previously, Drury made some preliminary studies of the new power plants including a visit to England to study the Napier Elan. Drury, co-owner, considered the Elan for the Gs Model 150, matched to the Allison 312D eight-cylinder engine.

## San Francisco Airport Raises Field Charges

San Francisco-San Mateo of higher field charges designed to put San Francisco International Airport in the black. In 1962 San Mateo adopted by the city Public Utilities Commission. Aeronautics have been asked to meet with the airport manager April 9 to negotiate on the proposed charges.

If the new schedule becomes effective July 1 it is planned some officials believe the airport will need no further tax support after this year.

The charges, which affect airlines according to their use of runways and other common facilities, would boost airport revenue from the present \$475,000 to \$585,000 annually. Income from landing fees would amount to 75% of the \$55 million revenue in the airport by the city, and would be 40% of that rate for 10 years. An investment increase, there would be some ratio in revenue during that period.

Interest from common use now amounts to one-third of the airport's revenue, but would jump to one-fourth under the new schedule.

Three companies—Trans World Airlines, Western Air Lines and United Air Lines—have contracts which include landing fees, but these are lower than

those paid by other airlines. The city will try to reach agreement with these companies on removal of landing fees from the contracts, at all airlines will pay the same rates.

In other action, the PUC voted to capitol Lambert & Glavin, San Francisco architects, to prepare plans for two new \$400,000 to \$1,000,000 commercial structures for the airport. These are part of the \$25 million bond program approved by voters last November.

## Newark Visibility Evaluation Changes

Newark, N. J.—Cibicor is conducting evaluation program at Newark Airport on May 1, 1975, will change from giving out threshold height estimates to approach light control height estimates.

U. S. Weather Bureau is conducting the program (AW Feb 18, p 107) under sponsorship of the Air Navigation Development Board and Air Force Civil Engineer Research Center.

The Weather Bureau said most pilots who have made approaches under reduced visibility conditions at Newark indicate preference for having the evaluation on the dual visual range to the approach lights instead of the threshold lights. The approach lights at Newark

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## SAFETY

### Hearing Seeks Answer to Northeast Crash

By Glenn Garmon

New York—Here a Northeast Airlines DC-6A which crashed on Flaming Meadow 1 1/2 miles into an unexpected descending turn after takeoff from LaGuardia Airport and whose pilots were members of a Civil Aeronautics Board test finding group here last month. Among possible answers to the first question suggested by eight days of testimony from some 50 witnesses was this:

- Powers redder than his, landing loop shafts after takeoff, heard how the plane into the unexpected turn.
- Partial power-off, the heavily loaded aircraft might have stalled in a turn and spun into the ground.
- These seemed to be such two possible answers to the second question the pilots were distracted from the instruments, or their instruments malfunctioned.

#### Pilot Testimony

Capt. Ake B. Marsh and Capt. B. S. Dorell testified they were racing through their instruments after the last cockpit check, but Marsh said the first warning he had that something was wrong during the 32-second flight was when Dorell yelled, "Al ground!" The plane crashed into the snow-covered field, sliding hundreds of feet and caught fire. Marsh pressed dead.

The inquiry was the third and largest held under CAB's new rules allowing ground questions by interested parties. It ended in New York with expressions of all parties of satisfaction with the procedure. Hearing will be followed in about two months with the Board report on the accident.

Testimony during the hearing delved into Northeast's ground handling procedures problems at LaGuardia. One of the items heard last night was reported testimony by the pilot. One passenger's ticket was not collected. Miscellaneous sounds of the engine and we were kept with complete accuracy.

Now for highlighting on the ground operation was "situation" from the cockpit. A. A. Lane, Northeast's vice president operations, told Aviation Week: The procedures themselves are safe and satisfactory, Lane pointed out, but there had been need for more attention to them.

On powerplant change incorporated

near the crash, Lane said, was in the cockpit. Plans now will not wait 500 ft of altitude to reached before an attempt is made to change radio frequency.

This change has taken some of the load off flight crew at their busiest time, Lane said, a need understood by the accident. But the more he no connection with any cause of the accident, Lane said.

#### Fact Finding

CAB member C. Joseph Morley, who was not on the accident board of inquiry explained at the start of the hearing that it was a purely fact-finding administrative procedure. The public inquiry followed a three-day preliminary conference held at New York last month.

Several main patterns of inquiry emerged:

- Was the DC-6A overloaded when it took off through the snow from Runway 4?
- Was the plane, owned by Mass Elford Corp., loaded by Flying Tiger Line and released by Northeast for its new Mass run, an improper mechanical condition at the time of the flight?

- Did electrical failure cause other malfunctions after the plane's instruments so the pilots received false information?
- Were the pilots maintaining the appropriate altitude and were they thoroughly experienced in using their radar under conditions?

Possibility of accident was increased from two points of view concerned passengers and baggage weight, and snow on wings and fuselage.

The plane had come into LaGuardia from Mass with the same crew and a light payload at 12:50 p.m. in the afternoon. It was scheduled to go out again at 2:45 p.m. but snow cleared and no more operations, both at the landing gate and at a gate lounge, delayed the flight here until 6 p.m.

According to the testimony of Northeast personnel, the load occupation was given to Capt. Marsh for the second flight showed a gross weight of 95,337 lb. including 82 adult passengers, six children, a crew of five and a check stewardess. The pilot received this information a few minutes before the scheduled departure time and it was the last word he had on his load before the flight began.

During the interval between sched-

uled and actual departure, the load changed. Correct figure at departure should have been gross weight 96,577 lb., 84 adult passengers, 5 children, crew of five and the check stewardess, and six children, total, 161.

Capt. Marsh failed to pick up one passenger's ticket and he was not seated in the last fully. Confusion was explained by substitution of four revenue passengers from a connecting flight for non-revenue passengers.

The load was, however, finally computed as less than the 97,375 lb. at low-level gross that was then applied to the flight. The first movement of low-level gross, Lane testified, should have been 95,946 lb., considering the narrow gradient and the 10 mph wind value.

Carelessly, testimony was heard at so the time the power reversal efforts at wing and larger ground crew gave up trying to clear the wings at the loading rate with twisting and Musco approaches, had the crew lost the plane to the nose lounge.

The plane, with its passengers still aboard and about a third of its length including the tail set out in the snow. Further, remained in the nose lounge about an hour.

#### Recovery Plans

Before it began to be cut out for takeoff, about 15 more recovery were lost in getting the aircraft clear of the nose lounge. Capt. Marsh been recovered passengers in 8:10 second hours trying to back the plane away from the nose lounge as it could be turned around. Two days South, sustained, and the plane failed out to the runway.

Third hour from last recovery efforts to takeoff about 15 minutes.

Both the pilot's and captain's testimony, however, clearly demonstrated the possibility of an overload or lift change from accumulation of the shifting snow. Marsh, whose experience with snow in New England was extensive, had been extra and he checked the lift wing during takeoff roll, and Capt. Dorell said he checked the right wing. Both were completely satisfied that the wings were not affected by snow.

Northeast Airlines had flown 354 hours in the DC-6A, which it maintained in cooperation with Flying Tiger. Plane had logged 5,351 hr. in Flying Tiger service when North-



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cost tested it in January, 1957. About 118 hours of the Northwest time was in scheduled service.

No evidence that anything was seriously wrong mechanically with the plane was introduced during the investigation. In fact, the pilot's reports that everything about the takeoff and level flight seemed normal up to the impact would seem to preclude any trouble except with controls or instruments.

But the investigators' review of the aircraft's flight instrument and historical record located "several areas of concern" regarding the way Northwest personnel were handling them. These included lack of proper filing or signing of flight logs, dropping of wire sheets, improper listing of replacement components, and failure of log sheets to conform to the master log, completed and retained by Flying Tigers.

### Record Differences

Largest discrepancy found in the records involved the time since overhaul of the #1 engine. This was recorded in the master log as 1,359 hr., the flight log of Jan. 3, Rockwood-McNamee, listed #1 engine time as 1,335.5 hr. At the beginning of the next flight, Jan. 5, the #1 log was listed as 1,323.3 hr. The error was continued throughout the operation of the plane. About 90 hr. discrepancy in the log is involved here.

Timmons also declared that the crew had had trouble with the #1 propeller, which was corresponding about 100 rpm and required logging in a flight, but this was not reported in series.

Another point capsule concerned in the logging was how thoroughly the tail sections of the plane had been checked for icing prior to takeoff. John Jos. Irving had mechanics, but said that nothing was done to the rudder or radio tabs during the deicing, but that he checked visually from a ladder. He could see the hinges and tabs, he said, and they were free of snow. If there was ice, it wasn't showing, Jos said.

The CWT's inspection started instruments reviewed logs the wreckage and also performed a series of electrical tests at Chicago Midway Airport. The electrical tests indicated that under certain conditions, electrical power to some instruments might be interrupted without a light warning the pilot of the failure. But nothing in the reports indicated whether the instruments on the Northwest DC-6A had failed.

Simple electrical test performed in another Flying Tiger DC-6A, as reported by the investigating group.

Power in Phase A of power to the captain's instrument transformer was removed. The captain's control

warning light did not come on at once. However, it did come on 5 seconds later while the group waited for gyro systems to trouble.

Phase A time was replaced, after allowing given to reach operating speed. Phase C time of moment, side of instrument transformer was pulled. Captain's instrument warning light came on at once.

Power was replaced. Following a similar procedure, Phase A and Phase C time of instrument side of transformer was individually removed. In each case the warning light came on as soon as time was removed.

All instruments were then spotted from the upper window and in cockpit hooded instrumentally opened to observe the location of the warning lights. When Phase A cockpit hooder was opened, neither the captain's nor first officer's warning light came on. When Phase C cockpit hooder was opened, the warning light came on at once.

### Another Test

With the severity selection again set on the captain's light and engine instruments were on the upper and the first officer's flight instruments on the lower, checks were made. Secondary voltage of the captain's instrument transformer was measured between Phases A and C and found to be 26 volts a.c. Allowing time for the gyro to reach operating speed, the Phase A circuit breaker of the upper window was opened. The secondary voltage rose from 26 to 29 volts and remained constant while being observed for 1.5 minutes.

Capt. J. D. Smith, speaking for Air Line Pilot Ann at the hearing's conclusion, said the case will require an unusual amount of further analysis and study. Particularly important, Smith said, will be the exploration of the use of electronics in airplanes. No one really understands all aspects of this matter in modern airplanes. Smith said, and he added that even now, it was uncertain what the best warning designers had been in the plane.

As to how the airplane could be turning and dropping without some indication to the pilot, such and that it seemed reasonable to assume that something must have been wrong with the instruments.

Timmons of the two captain gives the following picture of events in the cockpit prior to and during the flight.

The pilots in the cockpit, the aircraft on the more than half being adjusted as it was ready to go. Captain moved the first two-thirds of the plane at this time and all section of the aircraft, including the tail, was out of sight, visible. Fuel tank inspection was made.

Turning out to the main air after the delay in clearing the nose baggage,



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Mr. Cecil F. Sanderson, Supervisor of Technical Employment

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It will help to keep our readers interested in this advertising if you will acknowledge every application received, even if you merely return the letters of unsuccessful applicants with "Position filled, thank you" written or stamped on them.

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